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April 29, 2016

Mr. Michael Jacobi
EPA Region 3 Office of Remediation (3LC20)
1650 Arch Street
Philadelphia, PA 19103-2029

Revised Groundwater Monitoring Work Plan
Former DuPont Waynesboro Plant
Waynesboro, Virginia

Dear Mr. Jacobi:

DuPont received your email dated April 15, 2016 approving the proposed revisions to the Waynesboro Plant Groundwater Monitoring program. Enclosed are two copies and a CD of the final work plan, which includes the revisions.

If you have any questions, please feel free to contact me at 302-598-9936.

Sincerely,

Michael Liberati

Michael Liberati
Principal Project Director
DuPont Corporate Remediation Group

cc: Vince Maiden (VDEQ) – electronic copy via email
Don Kain (VDEQ) – electronic copy via email
Brett Fisher (VDEQ) – electronic copy via email
File: 504466

Environment

Submitted on behalf of
E.I. du Pont de Nemours and Company

Submitted by
AECOM
Sabre Building
Suite 300
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Revised Groundwater Monitoring Program Work Plan

Former DuPont Waynesboro Plant
Waynesboro, Virginia

Project #: 60482675.00006

April 2016

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1.0 Introduction

Since 2004, URS Corporation (now AECOM), on behalf of E.I. du Pont de Nemours and Company (DuPont) has been conducting semi-annual groundwater monitoring activities at the former DuPont Waynesboro Plant in accordance with the Resource Conservation and Recovery Act (RCRA) Routine Groundwater Monitoring Plan [DuPont Corporate Remediation Group (CRG), 2004]. The program was implemented after the Phase I RCRA Facility Investigation (RFI), which concluded that localized groundwater was impacted by mercury.

Groundwater monitoring results continue to confirm that mercury impacts to groundwater at the site occur as exceedances of relevant criteria that are localized to known-source areas. No widespread area of dissolved-phase mercury impact-to-groundwater (or “plume”) has been identified at the site. After completion of the final phase of Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI), it has been concluded that no completed pathways are present for human exposure to impacted groundwater from the site (URS, 2009).

In a letter to the EPA dated November 11, 2015, DuPont proposed modifications to the monitoring program that were based on long-term analysis of mercury concentrations in groundwater (DuPont CRG, 2015). The modified program reduces both quantity and sampling frequency of wells. The revised program was reviewed with the U.S. Environmental Protection Agency (EPA) and will be implemented beginning with the May 2016 sampling event.

1.1 Objectives

The objective of the groundwater sampling program is to monitor the site’s groundwater quality on an on-going basis. Specific objectives are as follows:

- Confirm that the quality of groundwater leaving the site remains below the relevant criteria and is consistent with time.
- Confirm that groundwater quality in source areas remains stable with time.

1.2 Work Plan Organization

The remainder of this work plan is organized into the following sections:

- Section 2 describes the site setting and hydrogeology
- Section 3 describes the groundwater sampling program.
- Section 4 describes the reporting requirements
- Section 5 contains the references cited in this work plan

2.0 Site Setting

The facility is located on approximately 177 acres of flat lying land along the South River in the southeastern corner of Waynesboro, Virginia (see Figure 1).

2.1 Site Background

DuPont began operations at the site by manufacturing acetate flake and yarn in 1929. In 1958, DuPont began producing Orlon®, the plant's second fiber. The flake and yarn process and Orlon process were discontinued in 1977 and 1990, respectively. In the interim, Lycra® production had begun in 1962, with Permasep® production beginning in 1969 (ceasing in 2000) and BCF Nylon in 1978. Fibers manufacturing operations will continue at the site for the foreseeable future.

Mercury-containing sludge was generated during the acetic anhydride process from 1929 to 1950. The sludge was decanted in the Chemical Building and transported in buggies to the mercury recovery area [Solid Waste Management Unit (SWMU) 1], where it was heated in furnaces until the mercury was evaporated, condensed, and collected in flasks. The mercury recovery area included two buildings, Sludge Recovery and Mercury Recovery, and two adjacent pits.

The site is located in an industrially zoned area. The South River bounds the plant on the northern side. Immediately adjacent to the southern boundary of the plant site is a mix of industrial facilities and residential communities. The area to the east of the plant is primarily residential and businesses with the area to the west being residential.

Further information regarding historical plant operations, physical setting, and previous investigations is provided in the *Comprehensive RFI Report* (URS, 2009).

2.2 Site Hydrogeology

The site is located within the Valley and Ridge Province of the Appalachian Chain, which consists of Quaternary-aged valley fill and highlands of Precambrian through Pennsylvanian-aged bedrock formations that have been subject to significant folding and deformation.

Overlying the bedrock is a transitional zone of weathered bedrock, which is overlain by unconsolidated alluvial overburden. Three primary saturated zones exist within the overburden at the site. These zones are designated herein as the Shallow Flow Zone, Deep Water Table Zone, and Deep Flow Zone. A secondary Perched Water Table Zone is present above the Deep Water Table Zone as evidenced by drilling activities in the northeastern area.

The Shallow Flow Zone occurs within the recent alluvial sand and gravel deposits. This water-table aquifer is unconfined and typically occurs at depths ranging from 3 feet below ground surface (bgs) in the center of the plant to 14 feet bgs along the South River. The saturated thickness of this aquifer within the plant area typically varies from 3 feet to 11 feet (a 7-foot average). The hydraulic conductivity of this aquifer averages 2.6×10^{-2} centimeters per second (cm/sec) (DuPont CRG, 2000). The principal direction of groundwater flow within the Shallow Flow Zone is toward the South River (north-northwest), which is the main point of discharge for groundwater. However, in the eastern portion of the site, groundwater flow in the Shallow Flow Zone is toward an area of deep clastic deposits, which underlie this area.

The area of deep clastic deposits in the northeast area of the site contains a deeper, unconfined saturated zone, which is referred to as the Deep Water Table Zone. This saturated zone is associated with an area of deeper granular sediments that underlie the site in this area. These sediments consist of sand and gravel from the surface to at least 100 feet bgs. Water levels in the Deep Water Table zone have been found to fluctuate in response to plant production well pumping (URS, 2009).

Overlying the Deep Water Table Zone is a zone of sporadic discontinuous lenses of perched groundwater referred to as the Perched Water Table Zone. The basis for this zone is the presence of upper saturated intervals, which were encountered during drilling activities in the northeastern area. There are no wells in the current monitoring network that are screened exclusively in this zone. Review of monitoring data and further review of well logs indicate that wells previously thought to represent the Perched Water Table Zone are actually Deep Water Table Zone wells, which are not deep enough to penetrate the water table when depressed.

The Deep Flow Zone is limited to the northwestern portion of the site along the South River. The Deep Flow Zone, which is confined or semi-confined, consists of a thin (5 feet to 9 feet thick) zone of saturated sandy and gravely clays within the silt and clay residuum. These units were encountered along the South River at depths of 30 to 40 feet bgs. The hydraulic conductivity of this aquifer averaged 4.1×10^{-4} cm/sec (DuPont CRG, 2000). Available information indicates that the Deep Flow Zone is not hydraulically connected to the overlying Shallow Flow Zone.

Northeasterly groundwater flow directions in the Shallow Flow Zone suggest that the shallow-zone groundwater flows into the area of deep sediments of the Deep Water Table Zone. Therefore, groundwater elevation contour maps are drawn to represent a single potentiometric surface, consisting of the Shallow and Deep Water Table Zones. Due to its limited horizontal extent, as evidenced by numerous deep borings completed at the site, the Deep Flow Zone in the silt-clay residuum along the river is not expected to be in communication with groundwater in this area.

3.0 Groundwater Sampling Program

This section describes the groundwater sampling program including sampling locations, sample collection techniques, and laboratory analyses that will be used to obtain groundwater samples.

3.1 Monitoring Wells

The wells included in the current groundwater monitoring program have been selected through analysis of historical data presented in the Groundwater Program Revision Letter dated November 11, 2015. Table 1 provides an inventory of all groundwater monitoring wells and production wells at the site and includes a summary of the current condition of each.

The monitoring network is designed to monitor the site's groundwater quality on a site-wide basis. Wells along the site perimeter are positioned to monitor shallow zone groundwater before exiting the site. Interior wells will be used to monitor non-impacted areas of the site for background purposes. Other wells will be used to monitor impacted groundwater in or adjacent to documented source areas (i.e., SWMU 1, SWMU 4, and SWMU 7). Table 2 lists which wells will be sampled and the purpose for each.

Wells located in the Northeast Area groundwater depression will monitor not only groundwater quality, but also water-level fluctuations of the depression observed that are caused by plant well pumping. Bedrock water quality and potentiometric surface elevations will also be monitored by both active and inactive plant production wells.

3.2 Sampling Frequency

DuPont performed an analysis of groundwater trend (see Appendix A) to determine stability of constituents in groundwater (DuPont CRG, 2015). Based on the evaluation, DuPont is recommending a reduction from semi-annual to annual groundwater monitoring at the site. The sampling frequency for all wells is shown in Table 2.

In addition to revising the sampling frequency, six wells are recommended for removal from the sampling plan.

Wells that are included in the revised monitoring program exhibit at least one the following attributes:

Total or dissolved concentrations of mercury from the well consistently exceed the VGS.

- The well is located downgradient of the source areas at the site perimeter.
- The well monitors communication between the overburden and bedrock groundwater.

3.3 Groundwater Sampling Procedures

A low-flow (minimum draw down) groundwater sampling technique will be used to purge monitoring wells and acquire groundwater samples. All groundwater samples will be collected as per the approved Quality Assurance Project Plan (QAPP) contained in the *Release Assessment/RCRA Facility Investigation Work Plan* (DuPont CRG, 2000), which summarizes the low-flow sampling procedures in accordance with EPA method

1669 ("clean-hands/dirty-hands"). EPA method 1669 was referenced to create a site-specific groundwater sampling protocol (see Appendix B).

During well purging, general groundwater quality parameters will be monitored to ensure that wells have been adequately purged prior to sample collection. This will include monitoring groundwater pH, oxidation-reduction (Redox), temperature, specific conductance, and dissolved oxygen. All field monitoring equipment (pH, temperature, and specific conductivity meters) will be calibrated in accordance with the manufacturer's requirements at the start of each day. During the day, the meters will be checked against standard solutions. If there is greater than a 10% difference between the standard and the measured value, the meter will be immediately re-calibrated.

3.4 Sample Analysis

All groundwater samples will be analyzed for total and dissolved mercury. Samples for dissolved mercury will be filtered in the field at the time of collection. EPA method 1631 will be used for mercury analysis, and the samples will be analyzed as per the approved QAPP (DuPont CRG, 2000).

All laboratory generated analytical data for Waynesboro will be evaluated using the DuPont In-House Quality Review Process. The DuPont In-House Quality Review Process has been approved by EPA Region III as equivalent to the requirements found in the Region III Innovative Approaches to Data Validation. Data will not be sent to a third party for external validation.

3.5 Water-Level Monitoring

As part of the routine groundwater monitoring at the site, groundwater elevations will be measured in each of the monitoring wells at the site during each sampling event. A total of 61 wells will be included in the water-level monitoring program (see Table 3). Groundwater elevations will be recorded for Shallow Zone, Deep Water Table, and Bedrock zones.

Measurements of the surface elevation of the South River will also be included as part of the water-level monitoring at the site. The surface elevation of the river will be measured at one permanent benchmarked location: SR-04 (see Figure 2) located adjacent to the plant along the river bank. Previous measuring benchmarks SR-01, SR-02, and SR-03 cannot be located or accessed and will not be used.

3.6 Decontamination Procedures

All sampling equipment will be decontaminated prior to sampling each well. Decontamination of equipment will be conducted as per the procedures described in the EPA-approved QAPP (DuPont CRG, 2000) and the procedures presented in Appendix B.

3.7 Waste Management

All derived waste [purge water, personal protective equipment (PPE), etc.] will be contained and disposed as per the *Project-Specific Waste Management Plan* (URS, 2010).

3.8 Health and Safety

All activities under this program will be performed in accordance with the *Health and Safety Plan, Former DuPont Waynesboro Plant* (URS, 2010).

4.0 Reporting

A report summarizing the sampling event activities and data will be prepared and submitted to the EPA on an annual basis. Each report, at a minimum, will include the following.

- Summary description of field activities
- Tables summarizing field and analytical data
- Maps showing groundwater flow direction
- Evaluation of the sampling event's data as compared to historical data
- Description of any activities that differed from the approved QAPP and/or this work plan

5.0 References

DuPont CRG. 2015. *Letter to U.S. Environmental Protection Agency Region 3. Proposed Revision to Groundwater Monitoring Program, Invista Waynesboro Plant, Waynesboro Virginia, HSWA Permit Number VAD003114832*. November 11, 2015.

DuPont CRG. 2009. *Letter to U.S. Environmental Protection Agency- Region III. Revised 2008 Groundwater Report and Proposed Monitoring Program, Invista Waynesboro Plant, Waynesboro Virginia, HSWA Permit Number VAD003114832*. June 17, 2009.

DuPont CRG. 2004. *RCRA Routine Groundwater Monitoring Plan*.

DuPont CRG.2000. *Release Assessment/RCRA Facility Investigation Work Plan*, *DuPont Waynesboro Site, Waynesboro, Virginia*.

URS. 2010. *Project-Specific Waste Management Procedures, Groundwater Monitoring, Former DuPont Waynesboro Plant*.

URS. 2010. *Health and Safety Plan, Former DuPont Waynesboro Plant*.

URS. 2009. *Comprehensive RFI Report, Former DuPont Waynesboro Plant, Waynesboro, Virginia.*

Tables

Table 1
Well Inventory
Former DuPont Waynesboro Plant

Well ID	Northing (SPC. VA-North)	Easting (SPC. VA-North)	Measuring Point Elevation (MSL)	Installation Date	Measured Total Depth (ft-btoc)	Well Casing Type	Well Diameter (inches)	Screen Length (feet)	Well Location	Hydrologic Unit
A	6705067.831	11372215.990	1287.39	1977	12.76	PVC	2	~2	SWMU 1	Shallow Flow Zone
B	6705206.557	11372078.620	1286.85	1977	11.38	PVC	2	~2	SWMU 1	Shallow Flow Zone
B'	6706037.604	11372134.264	1285.53	--	26.61	--	--	--	Perimeter- SR	Shallow Flow Zone
D'	6706176.060	11372300.258	1285.46	1980	19.56	PVC	2	5	Perimeter- SR	Shallow Flow Zone
E	6706192.303	11372184.418	1286.10	--	17.44	--	--	--	Perimeter- SR	Shallow Flow Zone
F	6705909.527	11372059.621	1285.85	1977	17.1	PVC	2	~2	Perimeter - SR	Shallow Flow Zone
G	6705724.428	11371930.148	1286.88	--	21.5	--	--	--	Perimeter- SR	Shallow Flow Zone
H	6705500.069	11371701.622	1285.60	1977	23.94	PVC	2	~2	Perimeter - SR	Shallow Flow Zone
H'	6705180.640	11371318.292	1288.33	1980	22.1	PVC	2	5	Perimeter - SR	Shallow Flow Zone
I	6705299.774	11371474.612	1288.88	--	22.29	--	--	--	Perimeter- SR	Shallow Flow Zone
K	6705598.177	11372570.186	1286.86	--	14.16	--	--	--	Interior	Shallow Flow Zone
L	6705455.954	11372329.749	1286.87	--	17.01	--	--	--	Interior	Shallow Flow Zone
Q	6704226.838	11370588.098	1310.08	--	12.81	--	--	--	Interior	Shallow Flow Zone
R	6704048.203	11370508.775	1309.81	1977	13.32	PVC	2	~2	Interior	Shallow Flow Zone
S	6703849.063	11369977.969	1317.35	--	25.15	--	--	--	SWMU 4	Shallow Flow Zone
SB1	6705645.951	11372404.163	1286.58	--	14.11	--	--	--	Interior	Shallow Flow Zone
SB2	6705607.329	11372438.753	1282.84	--	13.93	--	--	--	Interior	Shallow Flow Zone
U	6704486.156	11369610.446	1307.84	--	27.33	--	--	--	Interior	Shallow Flow Zone
Y	6705645.951	11372235.335	1285.36	--	26.71	--	--	--	Interior	Shallow Flow Zone
MW-1	6705591.340	11372843.142	1283.13	9-92	20.31	PVC	2	15	Interior	Shallow Flow Zone
MW-11A	6703872.654	11369753.831	1317.39	2000	17.8	PVC	2	10	SWMU 4	Shallow Flow Zone
MW-12	6703687.343	11369500.105	1319.53	2000	23.7	PVC	2	10	SWMU 4	Shallow Flow Zone
MW-12D	6703699.530	11369487.805	1319.98	2000	38.9	PVC	2	10	SWMU 4	Shallow Flow Zone
MW-13	6703797.711	11369916.555	1316.02	2000	12	PVC	2	10	SWMU 4	Shallow Flow Zone
MW-15	6707094.374	11372963.803	1282.33	2000	17.85	PVC	2	10	Perimeter - SR	Shallow Flow Zone
MW-16	6706771.672	11372321.790	1283.87	2000	21.9	PVC	2	10	Perimeter - SR	Shallow Flow Zone
MW-18	6705018.989	11371017.740	1287.19	2000	17.7	PVC	2	10	Perimeter - SR	Shallow Flow Zone
MW-19	6704870.447	11370561.339	1289.23	2000	20.5	PVC	2	10	Perimeter - SR	Shallow Flow Zone
MW-2	6705798.499	11372789.764	1283.17	9-92	18.8	PVC	2	15	Interior	Shallow Flow Zone
MW-20	6704788.732	11370208.376	1286.12	2000	18.23	PVC	2	10	Perimeter - SR	Shallow Flow Zone
MW-26	6704036.571	11369597.217	1310.74	3-04	27.5	PVC	2	10	SWMU 4	Shallow Flow Zone
MW-27	6704691.742	11371171.702	1284.05	3-04	8.2	PVC	2	5	Interior	Shallow Flow Zone
MW-28	6703858.255	11369581.739	1319.54	10-04	26.12	PVC	2	10	SWMU 4	Shallow Flow Zone
MW-29	6704482.316	11370441.067	1292.68	10-04	19.09	PVC	2	10	SWMU 6/7	Shallow Flow Zone
MW-3	6705757.896	11372764.107	1283.32	9-92	19.48	PVC	2	15	Interior	Shallow Flow Zone
MW-30	6704697.490	11370427.650	1287.63	2-07	10.2	PVC	2	5	Interior	Shallow Flow Zone
MW-31	6704766.479	11370422.509	1288.31	11-10	15	PVC	2	5	Interior	Shallow Flow Zone
MW-4	6705156.546	11372656.269	1283.87	9-92	15	PVC	2	15	Interior	Shallow Flow Zone
MW-5	6705006.510	11372985.439	1292.46	9-93	35	PVC	2	32	SWMU 1	Shallow Flow Zone
MW-22	6705808.475	11373239.391	1287.08	3-04	32	PVC	2	10	Perimeter - NE	Shallow Flow Zone

Table 1
Well Inventory
Former DuPont Waynesboro Plant

Well ID	Northing (SPC. VA-North)	Easting (SPC. VA-North)	Measuring Point Elevation (MSL)	Installation Date	Measured Total Depth (ft-btoc)	Well Casing Type	Well Diameter (inches)	Screen Length (feet)	Well Location	Hydrologic Unit
MW-22D	6705803.519	11373237.165	1287.15	3-04	63.2	PVC	2	10	Perimeter - NE	Shallow Flow Zone
MW-17D	6705895.091	11372044.985	1285.41	2000	43.09	PVC	2	10	Perimeter - SR	Deep Flow Zone
MW-19D	6704887.396	11370576.470	1289.34	2000	47	PVC	2	10	Perimeter - SR	Deep Flow Zone
MW-20D	6704746.763	11370189.618	1286.04	2000	42	PVC	2	10	Perimeter - SR	Deep Flow Zone
C'	6704914.078	11372494.972	1285.98	--	25.68	--	--	--	SWMU 1	Deep Water Table
O	6704911.505	11372492.524	1286.39	--	48.73	--	--	--	SWMU 1	Deep Water Table
MW-10	6705095.782	11372840.558	1288.29	4-93	37.5	PVC	2	35	SWMU 1	Deep Water Table
MW-10A	6705103.862	11372845.136	1288.03	7-93	77	PVC	2	60	SWMU 1	Deep Water Table
MW-21D	6704929.964	11372381.715	1286.34	3-04	61.9	PVC	2	10	SWMU 1	Deep Water Table
MW-23D	6704879.152	11372732.849	1295.66	3-04	65.2	PVC	2	10	SWMU 1	Deep Water Table
MW-24	6704487.268	11372192.752	1291.00	3-04	37.1	PVC	2	10	SWMU 1	Deep Water Table
MW-24D	6704482.548	11372191.179	1290.77	3-04	57.8	PVC	2	10	SWMU 1	Deep Water Table
MW-25D	6704481.670	11371518.184	1288.62	3-04	53.2	PVC	2	10	Interior	Deep Water Table
MW-6	6704864.294	11372729.337	1293.28	9-93	45.9	PVC	2	20	SWMU 1	Deep Water Table
MW-7	6704983.394	11372566.142	1283.71	4-93	40.3	PVC	2	35	SWMU 1	Deep Water Table
MW-7A	6704990.882	11372572.985	1283.90	7-93	53.1	PVC	2	50	SWMU 1	Deep Water Table
MW-8	6704337.231	11370966.128	1290.94	4-93	31.75	PVC	2	30	Interior	Deep Water Table
MW-8D	6704361.270	11371020.210	1294.31	2-07	45.49	PVC	2	10	Interior	Deep Water Table
MW-9A	6704668.541	11371956.526	1282.96	7-93	89.7	PVC	2	70	SWMU 1	Deep Water Table
PW-02	6704767.190	11371373.320	--	1929	734	Steel	8	--	Interior	Bedrock
PW-03	6705729.740	11372811.600	--	1929	676	Steel	8	--	Interior	Bedrock
PW-04	6706203.880	11373141.010	--	1936	674	Steel	8	--	Interior	Bedrock
PW-05	6706068.510	11372134.800	--	1938	729	Steel	12	--	Interior	Bedrock
Well #1	6704836.761	11372469.023	1283.21	1929	592	Steel	12	--	SWMU 1	Bedrock
Old Flowing Well	6705693.886	11372266.374	1281.85	1920s	--	Steel	--	--	Interior	Bedrock

NOTES:

Water Level data collected from all wells.

SPC VA-North	= Virginia State Plane Coordinates - North Zone.
MSL	= Feet above mean sea level.
ft-btoc	= Feet below top of casing.
--	= Not Available
Perimeter - SR	= Perimeter well along South River or Rockfish Run.
Perimeter - NE	= Perimeter well along Northeast Plant Area.
SWMU 1	= Well located up or down gradient of SWMU 1 - Mercury Recovery.
SWMU 4	= Well located up or down gradient of SWMU 4 - Incineration Area.
SWMU 6/7	= Well located down gradient of SWMU 6 - WWTP and SWMU 7 - Sludge Pond.
Interior	= Well located within site interior.

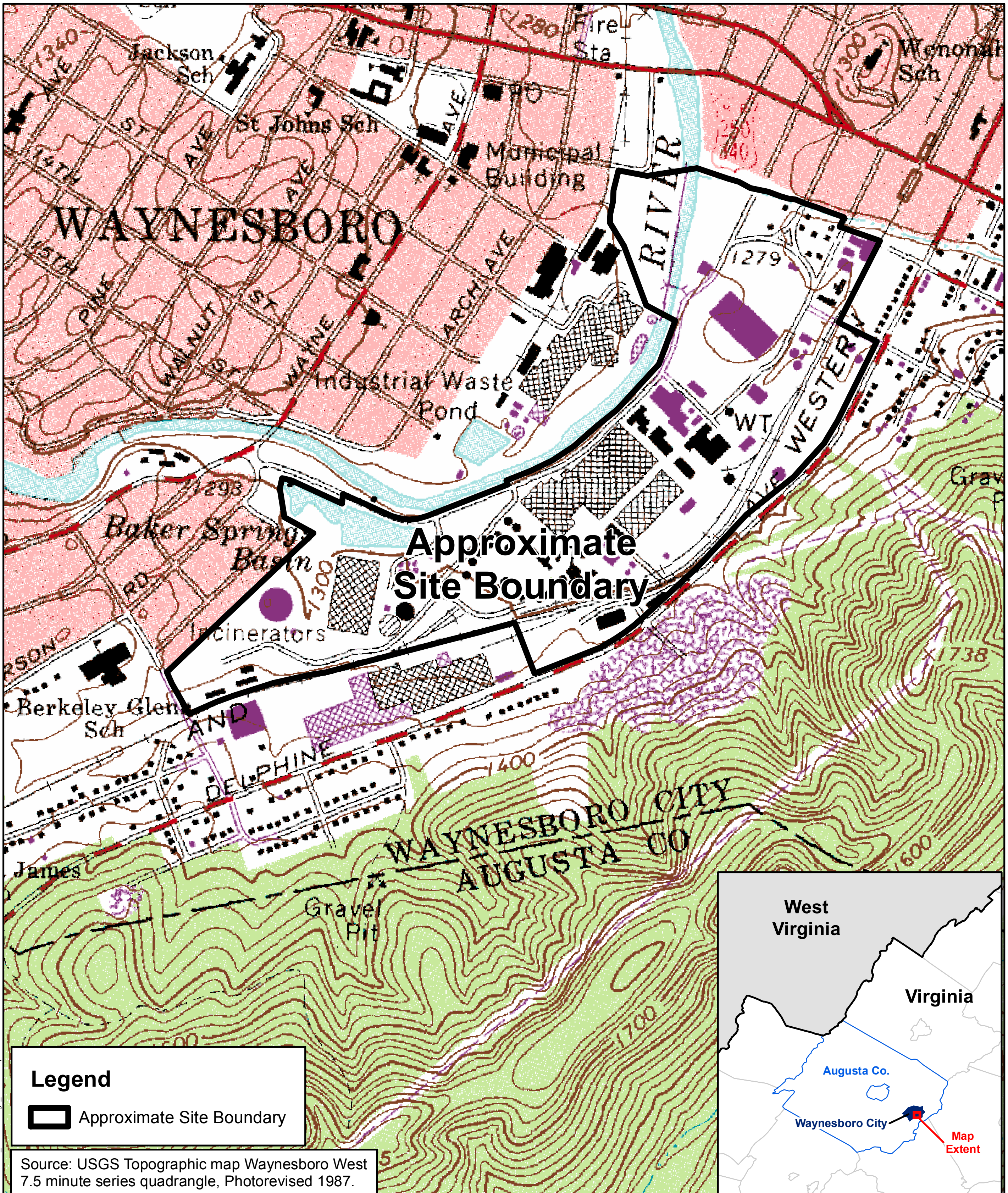
Table 2
Analytical Sampling Program
Former DuPont Waynesboro Plant

Well ID	Well Location	Hydrologic Unit	Proposed Sampling Frequency	Justification
Monitoring Well List				
A	SWMU 1	Shallow Flow Zone	Annual	Both total and dissolved concentrations are consistently above VGS criteria
B	SWMU 1	Shallow Flow Zone	Annual	Dissolved concentrations are consistently below VGS criteria; variations in total Hg
F	Perimeter - SR	Shallow Flow Zone	Annual	Monitor shallow flow Hg concentrations downgradient of source areas
H	Perimeter - SR	Shallow Flow Zone	Annual	Monitor shallow flow Hg concentrations downgradient of source areas
H'	Perimeter - SR	Shallow Flow Zone	Annual	Monitor shallow flow Hg concentrations downgradient of source areas
MW-05	NE Area/ SWMU 1	Deep Water Table	Annual	Dissolved concentrations consistently below VGS criteria; variations in total Hg
MW-06	NE Area/ SWMU 1	Deep Water Table	Annual	Routinely dry; dissolved samples below VGS criteria; variations in total Hg
MW-07B	NE Area/ SWMU 1	Deep Water Table	Annual	Dissolved concentrations consistently above VGS criteria; variations in total Hg
MW-09B	NE Area/ SWMU 1	Deep Water Table	Annual	Variations in concentrations of total and dissolved Hg
MW-10	NE Area/ SWMU 1	Deep Water Table	Annual	Dissolved concentrations are consistently below VGS criteria; variations in total Hg
MW-10B	NE Area/ SWMU 1	Deep Water Table	Annual	Dissolved concentrations are consistently below VGS criteria; variations in total Hg
MW-11A	SWMU 4	Shallow Flow Zone	Annual	Both total and dissolved concentrations are consistently above VGS criteria
MW-12	SWMU 4	Shallow Flow Zone	Annual	Dissolved concentrations are consistently below VGS criteria; variations in total Hg
MW-12D	SWMU 4	Shallow Flow Zone	Annual	Dissolved concentrations are consistently below VGS criteria; variations in total Hg
MW-13	SWMU 4	Shallow Flow Zone	Annual	Dissolved concentrations are consistently below VGS criteria; variations in total Hg
MW-15	Perimeter - SR	Shallow Flow Zone	Annual	Monitor shallow flow Hg concentrations downgradient of source areas
MW-16	Perimeter - SR	Shallow Flow Zone	Annual	Monitor shallow flow Hg concentrations downgradient of source areas
MW-18	Perimeter - SR	Shallow Flow Zone	Annual	Monitor shallow flow Hg concentrations downgradient of source areas
MW-19	Perimeter - SR	Shallow Flow Zone	Annual	Monitor shallow flow Hg concentrations downgradient of source areas
MW-20	Perimeter - SR	Shallow Flow Zone	Annual	Monitor shallow flow Hg concentrations downgradient of source areas
MW-21D	NE Area/ SWMU 1	Deep Water Table	Annual	Dissolved concentrations are consistently below VGS criteria; variations in total Hg
MW-22	Perimeter - NE	Deep Water Table	Annual	Dissolved concentrations are consistently below VGS criteria; variations in total Hg
MW-23D	NE Area/ SWMU 1	Deep Water Table	Annual	Dissolved concentrations are consistently below VGS criteria; variations in total Hg
MW-24	NE Area/ SWMU 1	Deep Water Table	Annual	Dissolved concentrations are consistently below VGS criteria; variations in total Hg
MW-26	SWMU 4	Shallow Flow Zone	Annual	Both total and dissolved concentrations are consistently above VGS criteria
MW-28	SWMU 4	Shallow Flow Zone	Annual	Both total and dissolved concentrations are consistently above VGS criteria
MW-29	SWMU 7	Shallow Flow Zone	Annual	Both total and dissolved concentrations are consistently above VGS criteria
MW-30	SWMU 7	Shallow Flow Zone	Annual	Variations in total and dissolved Hg above VGS criteria
MW-31	SWMU 7	Shallow Flow Zone	Annual	Variations in total and dissolved Hg above VGS criteria
Well #1	NE Area/ SWMU 1	Bedrock Zone	Annual	Monitor communication between overburden and bedrock GW
PW-02	Interior	Bedrock Zone	Annual	Monitor communication between overburden and bedrock GW
PW-03	Interior	Bedrock Zone	Annual	Monitor communication between overburden and bedrock GW
PW-05	Interior	Bedrock Zone	Annual	Monitor communication between overburden and bedrock GW
Wells to be Removed from Program				
PW-04	Interior	Bedrock Zone	None	Abandoned
R	Interior	Shallow Flow Zone	None	Total and dissolved concentrations are consistently below VGS criteria
MW-08D	Interior	Deep Water Table	None	Total and dissolved concentrations are consistently below VGS criteria
MW-22D	Perimeter - NE	Deep Water Table	None	Total and dissolved concentrations are consistently below VGS criteria
MW-24D	NE Area/ SWMU 1	Deep Water Table	None	Total and dissolved concentrations are consistently below VGS criteria
MW-25D	NE Area/ SWMU 1	Deep Water Table	None	Total and dissolved concentrations are consistently below VGS criteria

Table 3
Water-Level Measurement Plan
Former DuPont Waynesboro Plant

Well	Measuring Point Elevation	Hydrologic Unit	Proposed WL measurement Frequency	Purpose
SR-03	1293.71	South River	Annual	Sitewide groundwater elevation contouring
SR-04	1299.74	South River	Annual	Sitewide groundwater elevation contouring
A	1288.16	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
B	1287.62	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
B'	1286.23	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
D'	1286.10	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
E	1286.87	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
F	1286.63	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
G	1286.88	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
H	1286.34	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
H'	1289.06	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
I	1289.63	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
K	1287.58	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
L	1287.60	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
Q	1310.88	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
R	1310.40	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
S	1318.92	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
SB1	1286.58	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
SB2	1286.76	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
U	1308.63	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
Y	1286.05	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-1	1283.98	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-11A	1317.39	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-12	1319.53	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-12D	1319.98	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-13	1316.02	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-15	1282.33	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-16	1283.87	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-18	1287.19	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-19	1289.23	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-2	1283.99	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-20	1286.12	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-26	1310.74	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-27	1284.05	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-28	1319.54	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-29	1292.68	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-3	1284.11	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-30	1287.63	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-4	1283.75	Shallow Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-17D	1285.41	Deep Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-19D	1289.34	Deep Flow Zone	Annual	Sitewide groundwater elevation contouring
MW-20D	1286.04	Deep Flow Zone	Annual	Sitewide groundwater elevation contouring
C'	1288.16	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
MW-10A	1288.03	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
MW-21D	1286.34	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
MW-22	1287.08	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
MW-22D	1287.15	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
MW-23D	1295.66	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
MW-24D	1290.77	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
MW-25D	1288.62	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
MW-7B	1283.90	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
MW-9A	1282.96	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
MW-10	1289.02	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
MW-24	1291.00	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
MW-5	1293.28	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
MW-6	1296.43	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
MW-8	1291.67	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
MW-8D	1294.31	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
O	1288.43	Deep Water Table	Quarterly	Monitor fluctuations in Northeast Area GW depression
Well #1	1283.21	Bedrock Zone	Quarterly	Monitor fluctuations in Northeast Area GW depression
Old Flowing Well	1281.85	Bedrock Zone	Quarterly	Monitor fluctuations in Northeast Area GW depression

Figures



C:\DuPont\Waynesboro Plant\GIS\Project\60482675_GWMonPlan_Mar2016\Fig1_SiteLocMap.mxd

N S E W

0 250 500 1,000

Feet

1 inch = 1,000 feet

MAP FORMATTED FOR "A" (8.5" X 11") SIZE SHEET. TEXT SCALE NOT VALID FOR DIFFERENT PAGE SIZE.

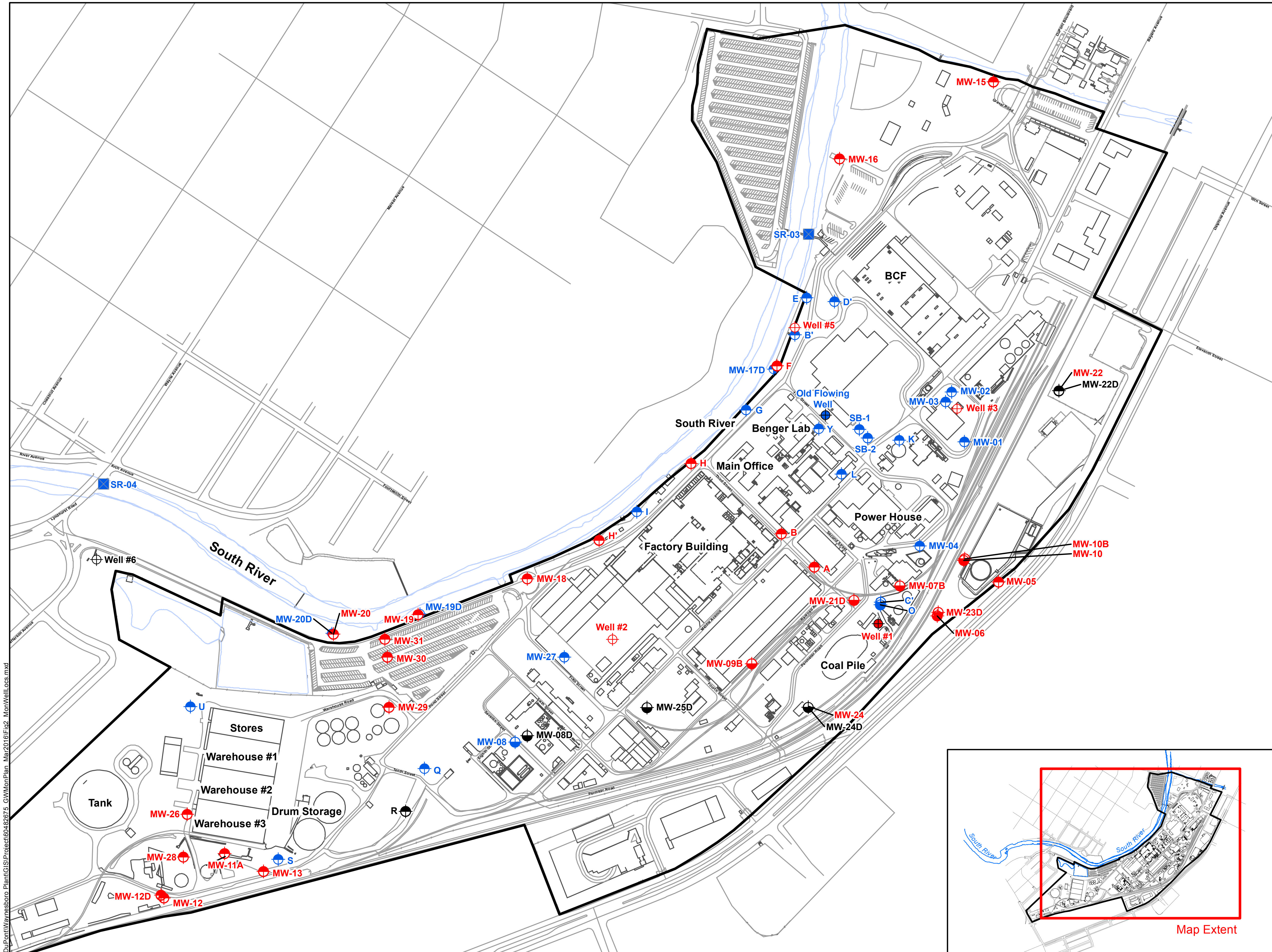
TASK NUMBER:	00006
DESIGNED BY:	CAD
DRAWN BY:	CAD
DATA QUALITY CHECK BY:	CLM

AECOM
Sabre Building, Suite 300
4051 Ogletown Road
Newark, DE 19713

SITE LOCATION MAP

Former DuPont Waynesboro Plant
Waynesboro, VA

PROJECT NUMBER:	60482675
DATE:	3/29/2016
FIGURE NUMBER:	1



C:\DuPont\Waynesboro Plant\GIS\Project\60482675_GWMonPlan_Mar2016\Fig2_MonWellLocs.mxd

Legend

- Shallow Flow Zone Monitoring Well in Sampling Program
- Deep Water Table Zone Monitoring Well in Sampling Program
- Active Plant Production Well in Sampling Program
- Decommissioned Plant Production Well (Bedrock Zone) in Sampling Program
- Shallow Flow Zone Monitoring Well for Water Elevation Only
- Deep Flow Zone Monitoring Well for Water Elevation Only
- Deep Water Table Zone Monitoring Well for Water Elevation Only
- Decommissioned Plant Production Well (Bedrock Zone) for Water Elevation Only
- South River Water Level Location for Water Elevation Only
- Active Plant Production Well
- Shallow Flow Zone Monitoring Well Removed from Sampling Program
- Deep Water Table Zone Monitoring Well Removed from Sampling Program
- Approximate Site Boundary
- Basemap Feature
- Surface Water
- Site Structure

Notes:
Map Projection: NAD83 Virginia North State Plane Feet

N W E S

0 200 400 800
Feet
1 inch = 400 feet

MAP FORMATTED FOR "B" (11" X 17") SIZE SHEET.
TEXT SCALE NOT VALID FOR DIFFERENT PAGE SIZE.

AECOM

AECOM
Sabre Building, Suite 300
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Newark, DE 19713

MONITORING WELL LOCATIONS

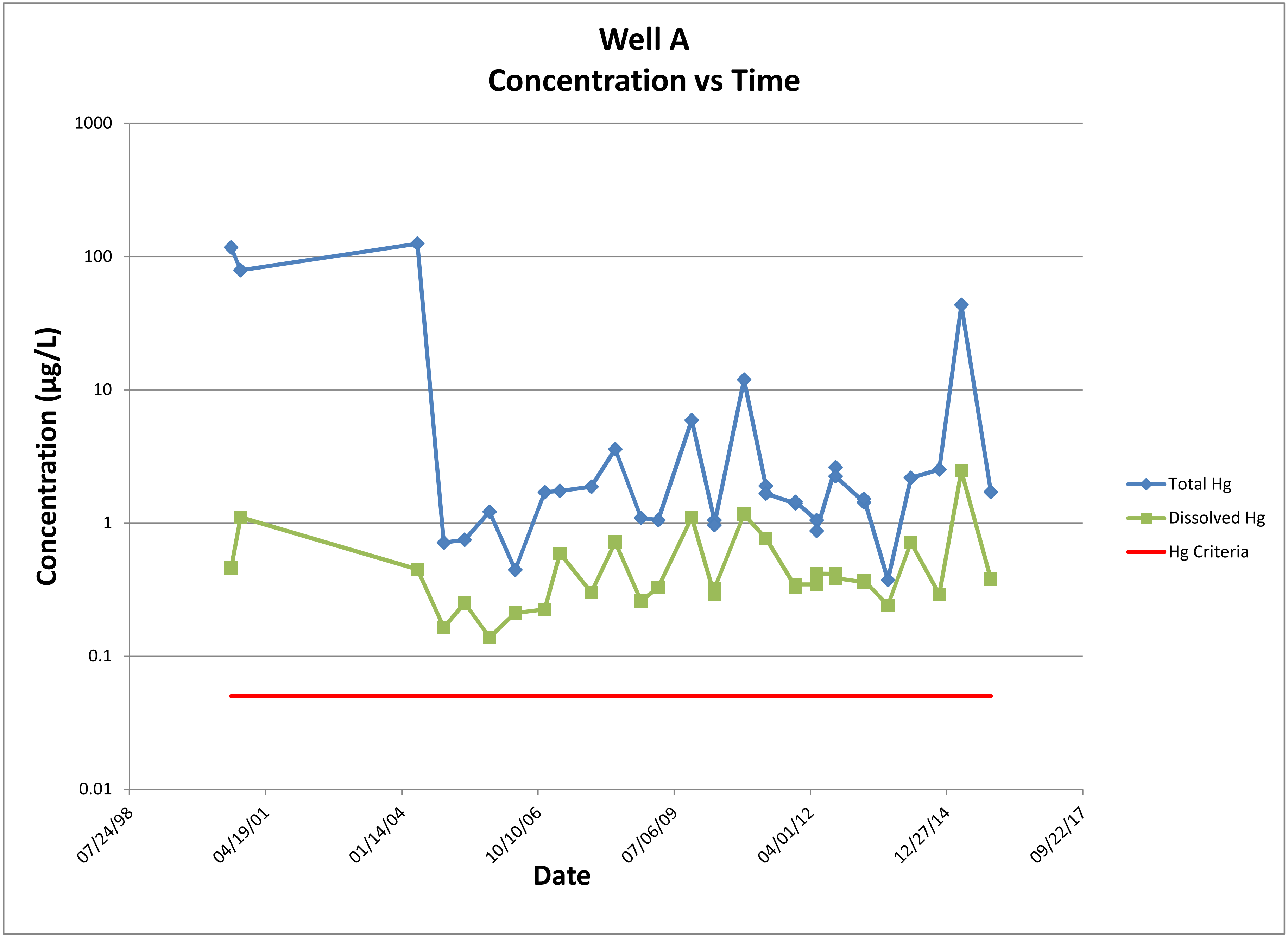
Former DuPont Waynesboro Plant
Waynesboro, VA

FILE NUMBER: 00006	PROJECT NUMBER: 60482675
DESIGNED BY: RBW/CLM	DATE: 4/1/2016
DRAWN BY: CAD	FIGURE NUMBER: 2
DATA QUALITY CHECK BY: RBW	

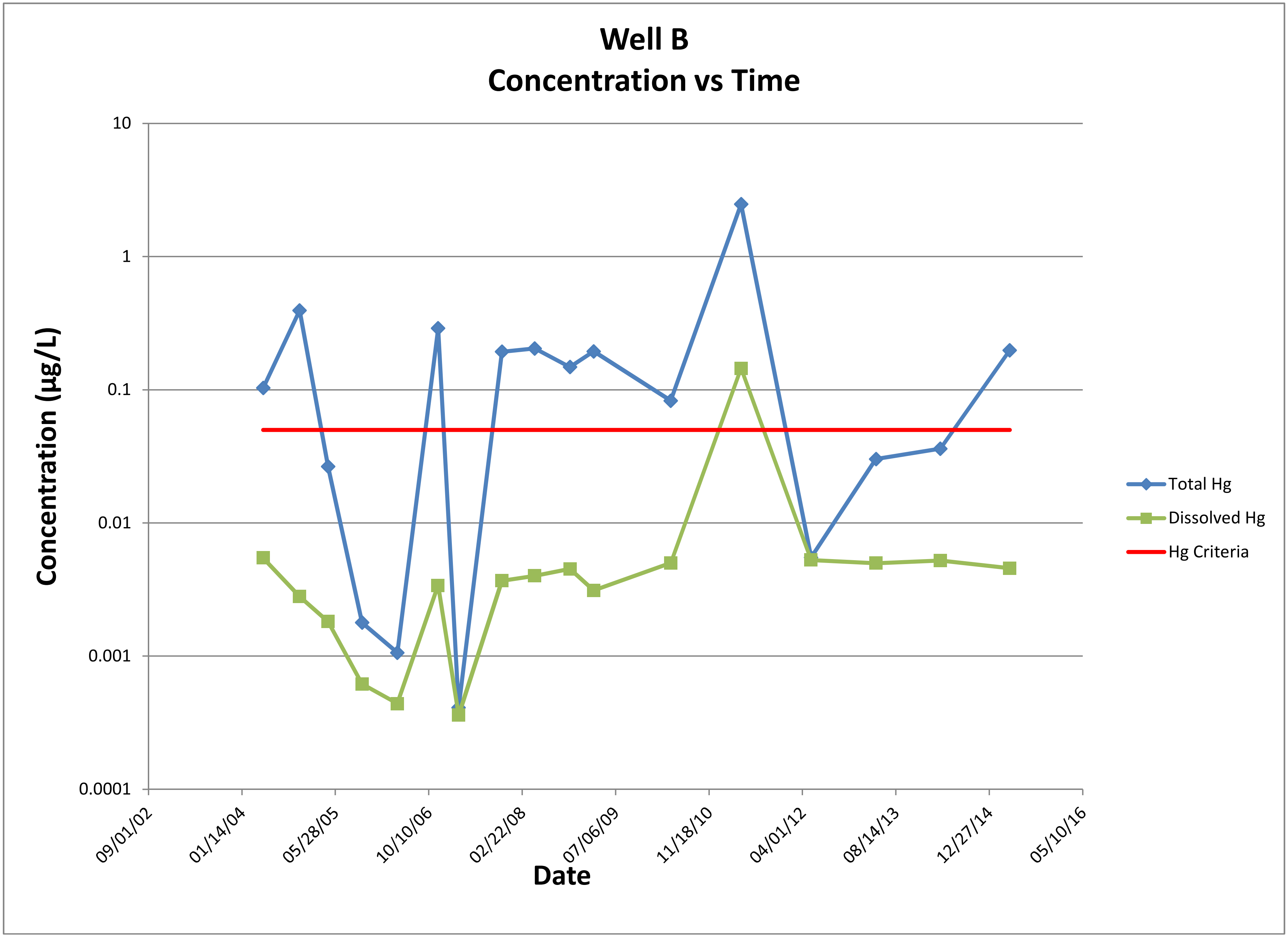
Appendices

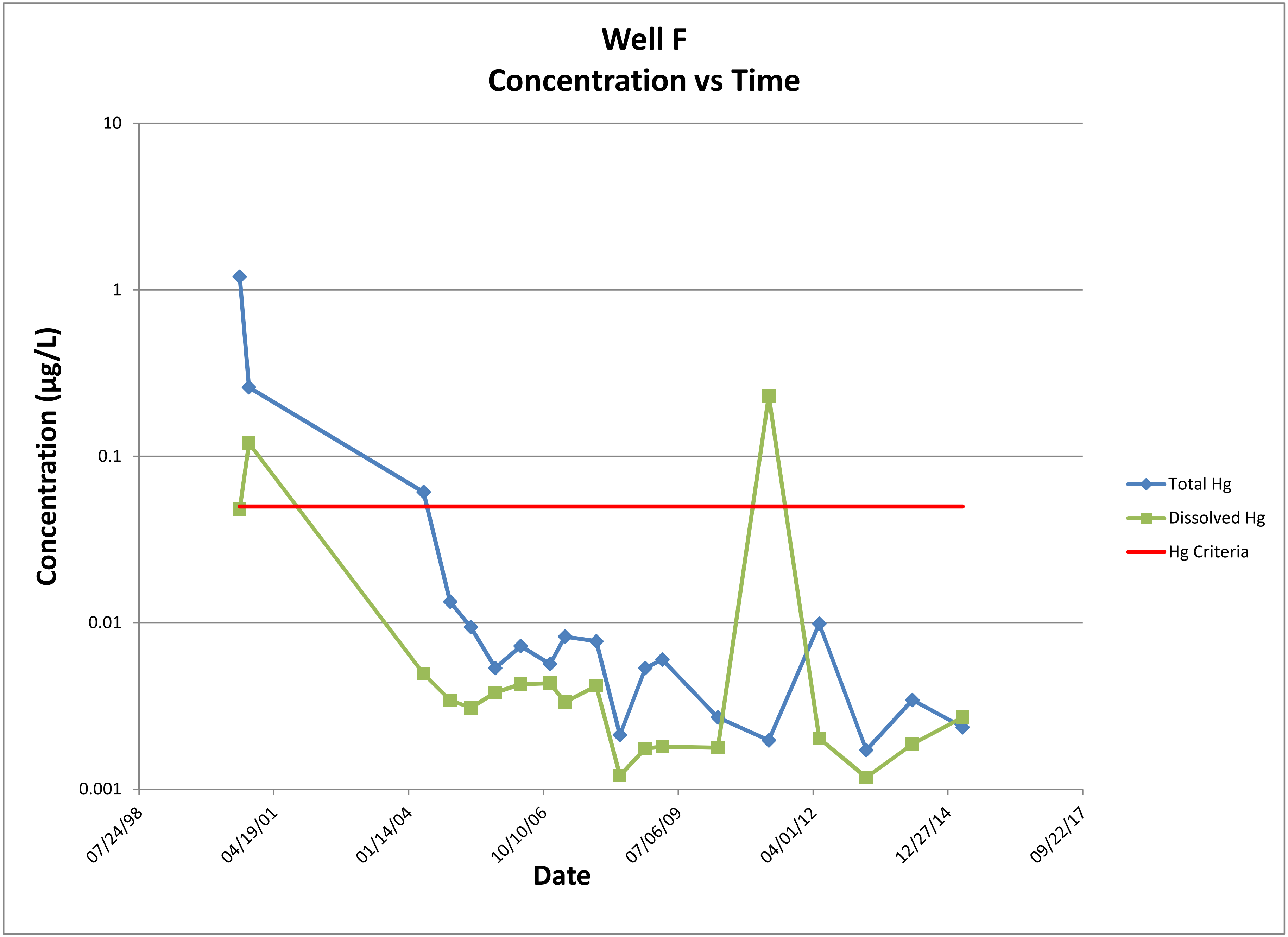
Appendix A

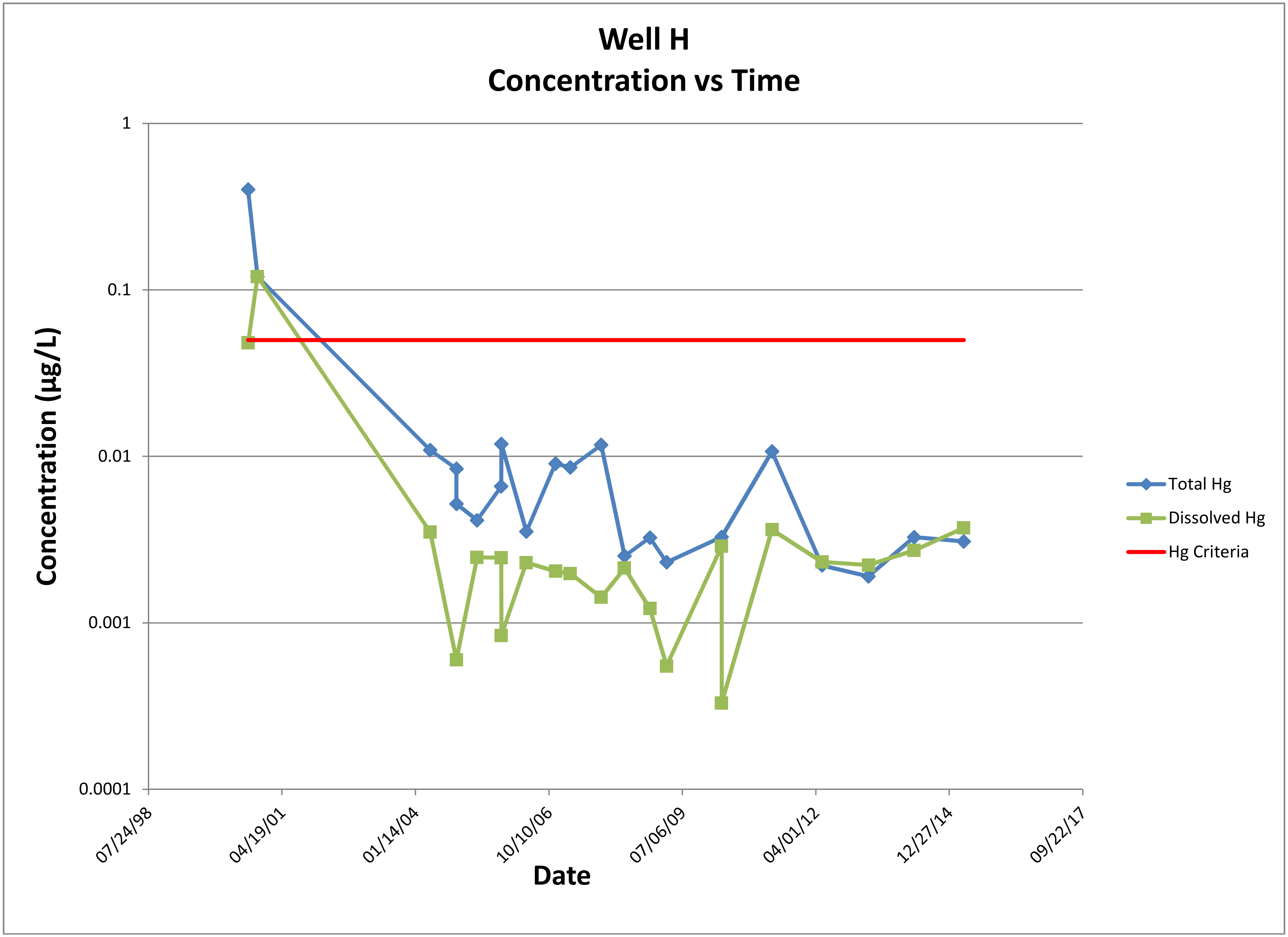
Trends Overburden and Bedrock Wells



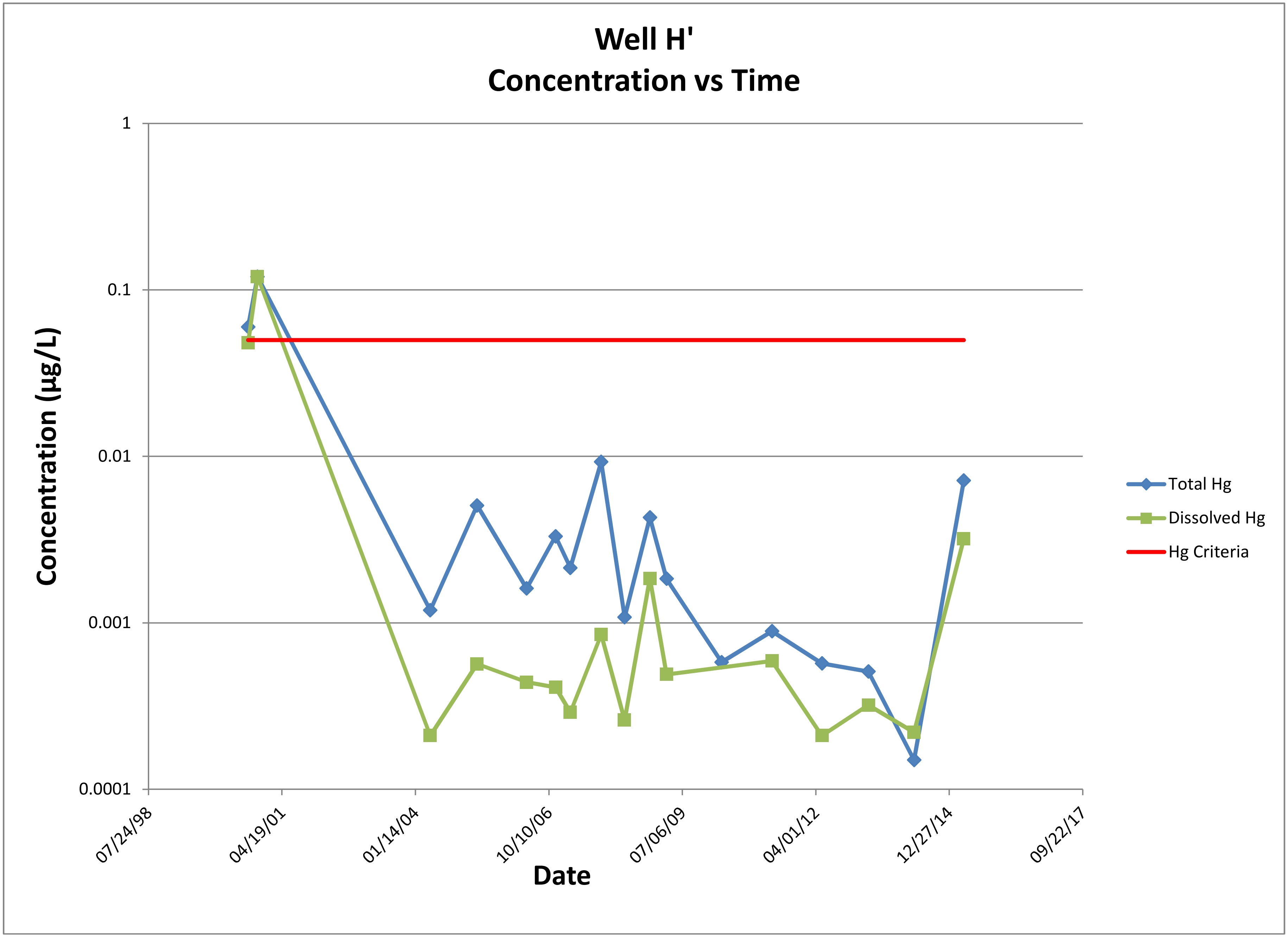
Well A
Concentration vs Time
1000
100
10
1
0.1
0.01
Concentration (µg/L)
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria


Well B
Concentration vs Time
10
1
0.1
0.01
0.001
0.0001
Concentration (µg/L)
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
Date
Total Hg
Dissolved Hg
Hg Criteria

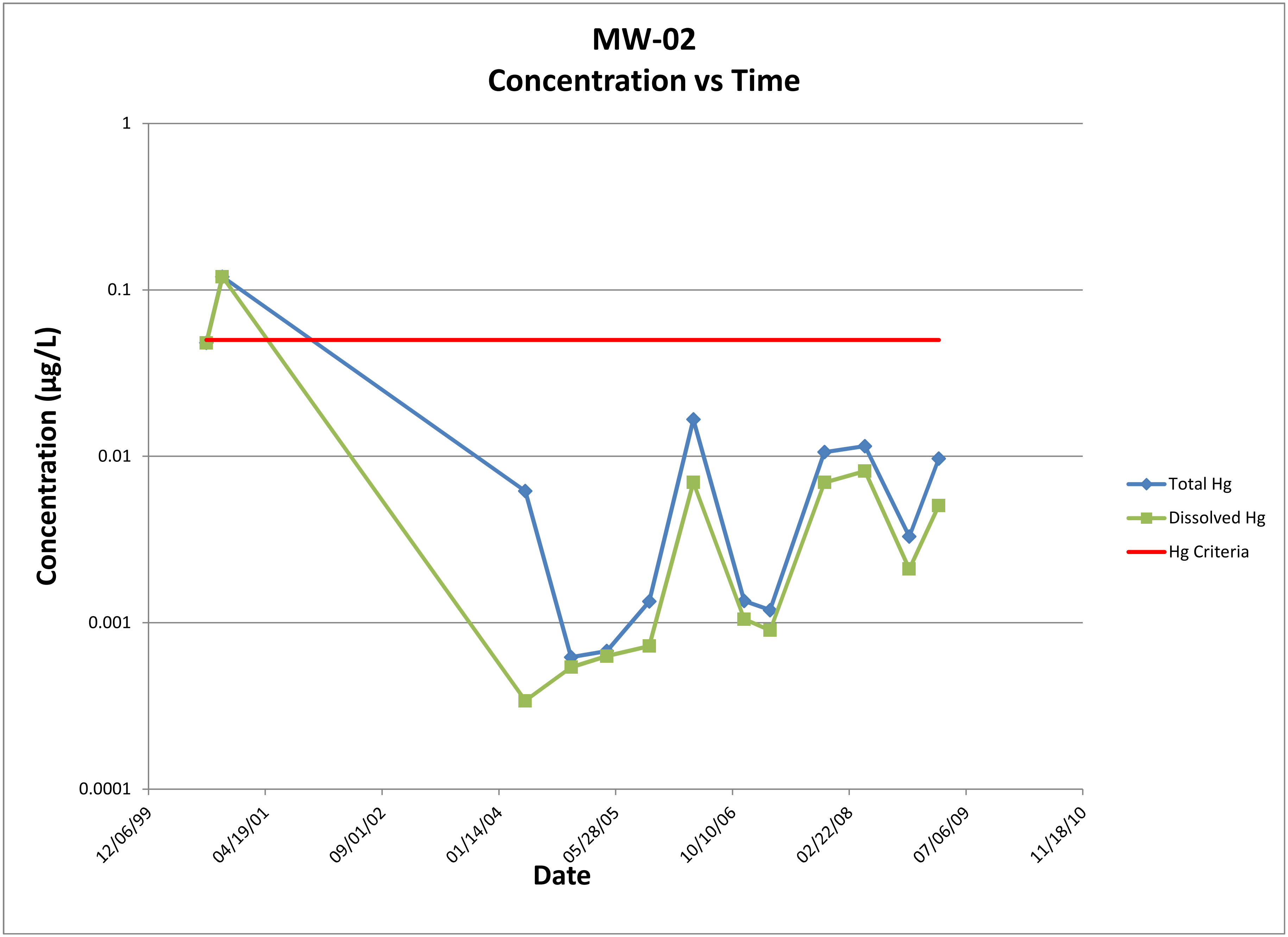

Well F
Concentration vs Time
10
1
0.1
0.01
0.001
Concentration (µg/L)
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria



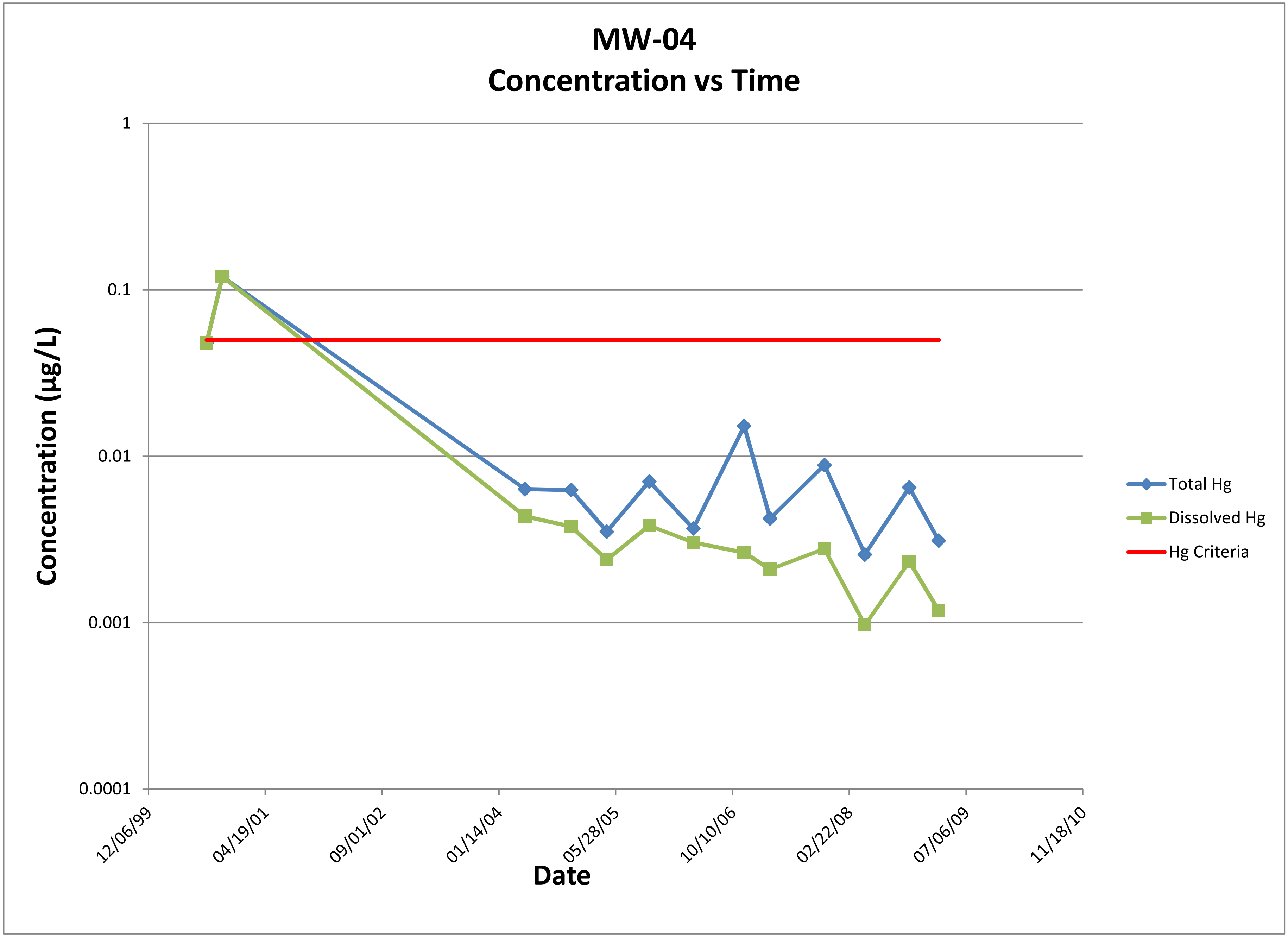
Well H
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
0.0001
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria



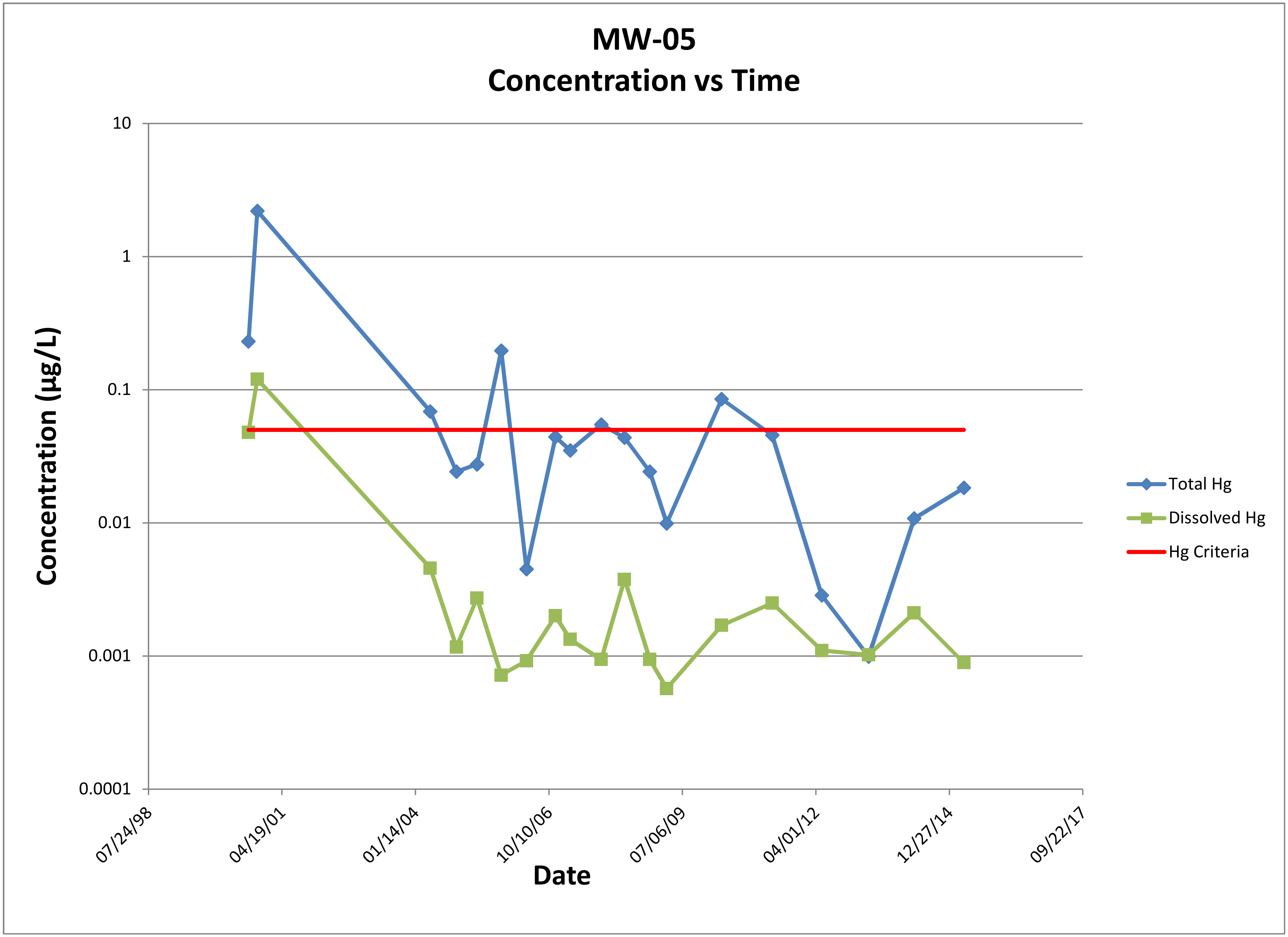
Well H'
Concentration vs Time
1
0.1
0.01
0.001
0.0001
Concentration (µg/L)
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria



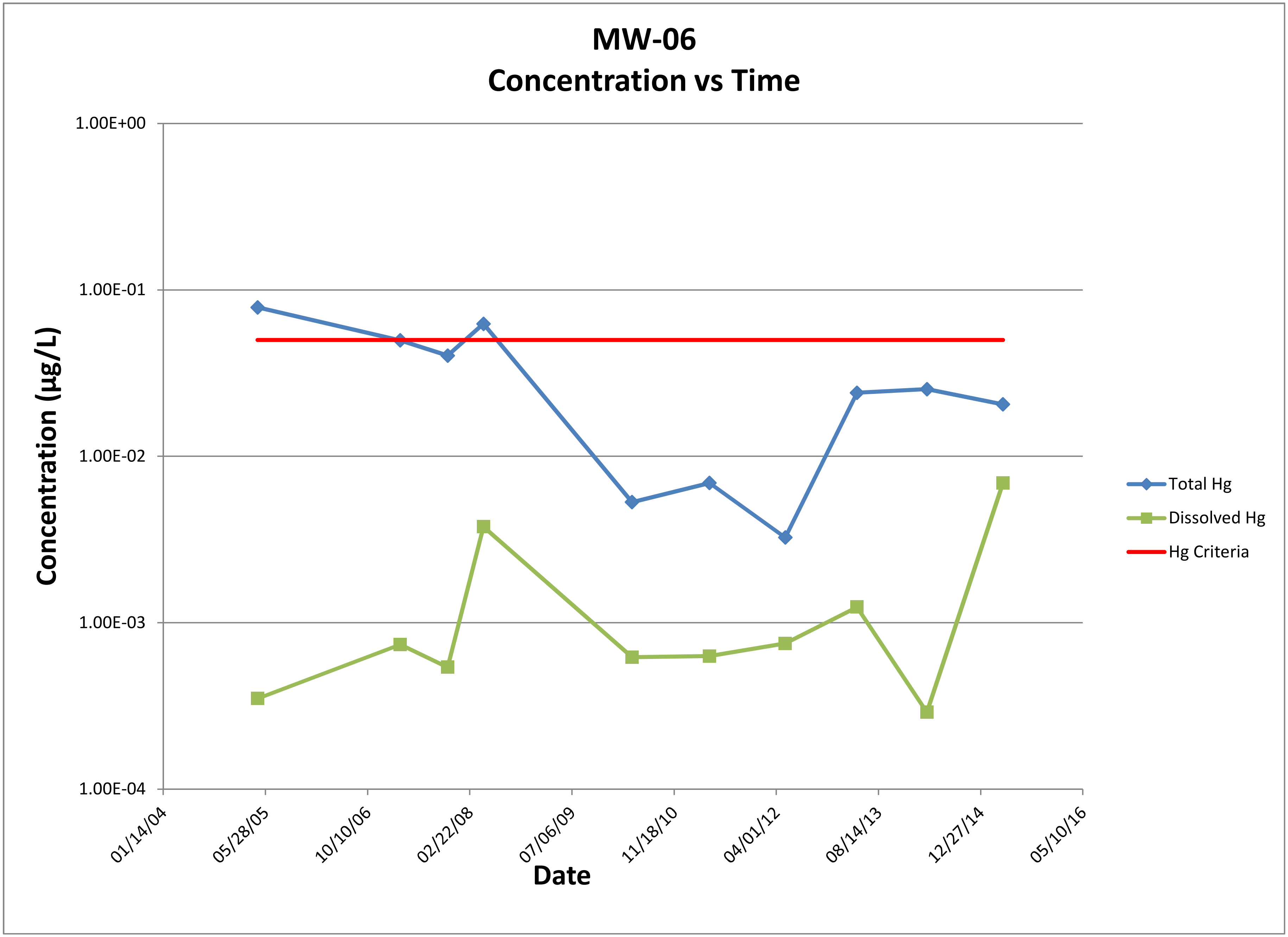
MW-02
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
0.0001
12/06/99
04/19/01
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
Date
Total Hg
Dissolved Hg
Hg Criteria

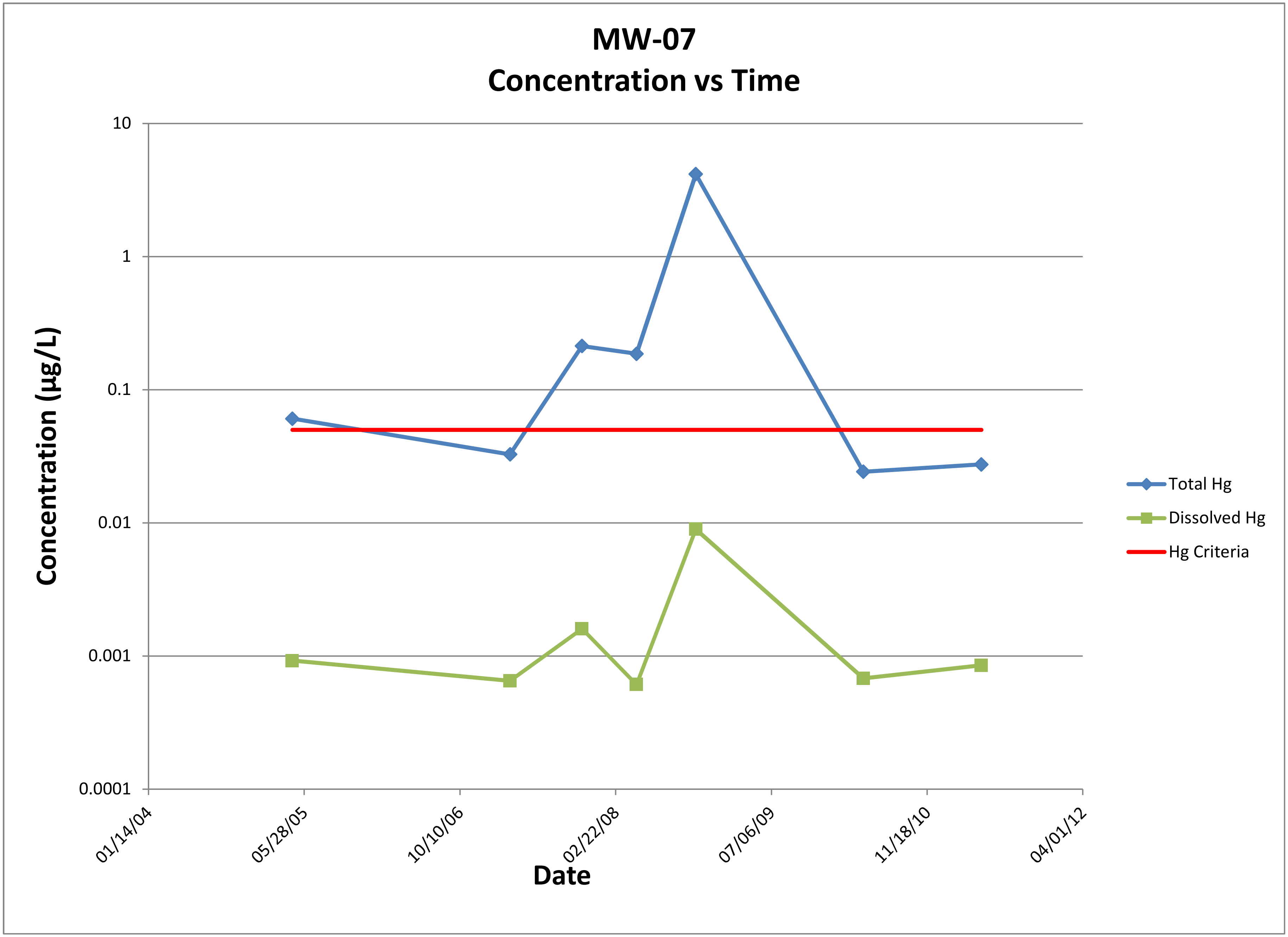


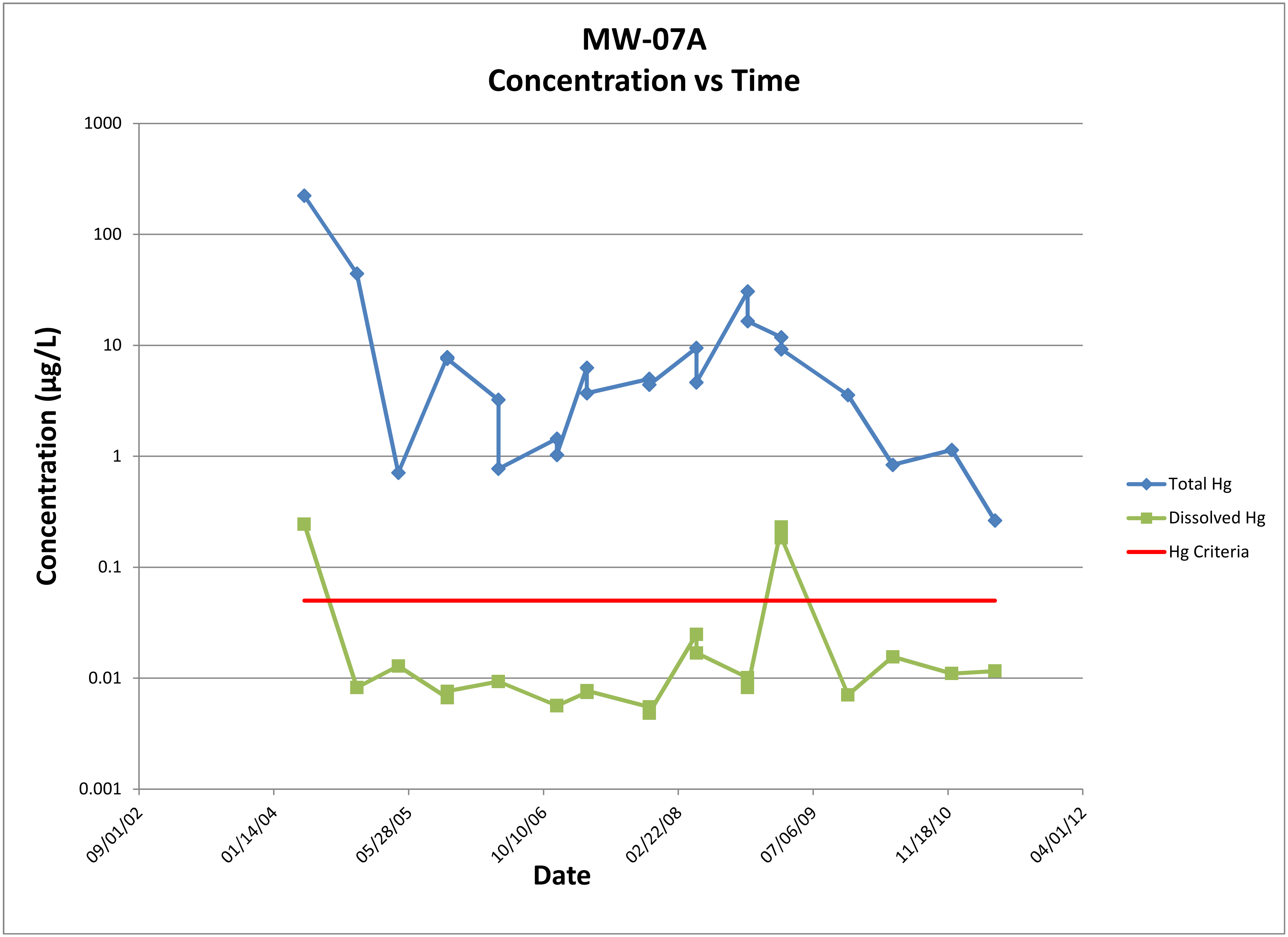
MW-04
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
0.0001
12/06/99
04/19/01
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
Date
Total Hg
Dissolved Hg
Hg Criteria

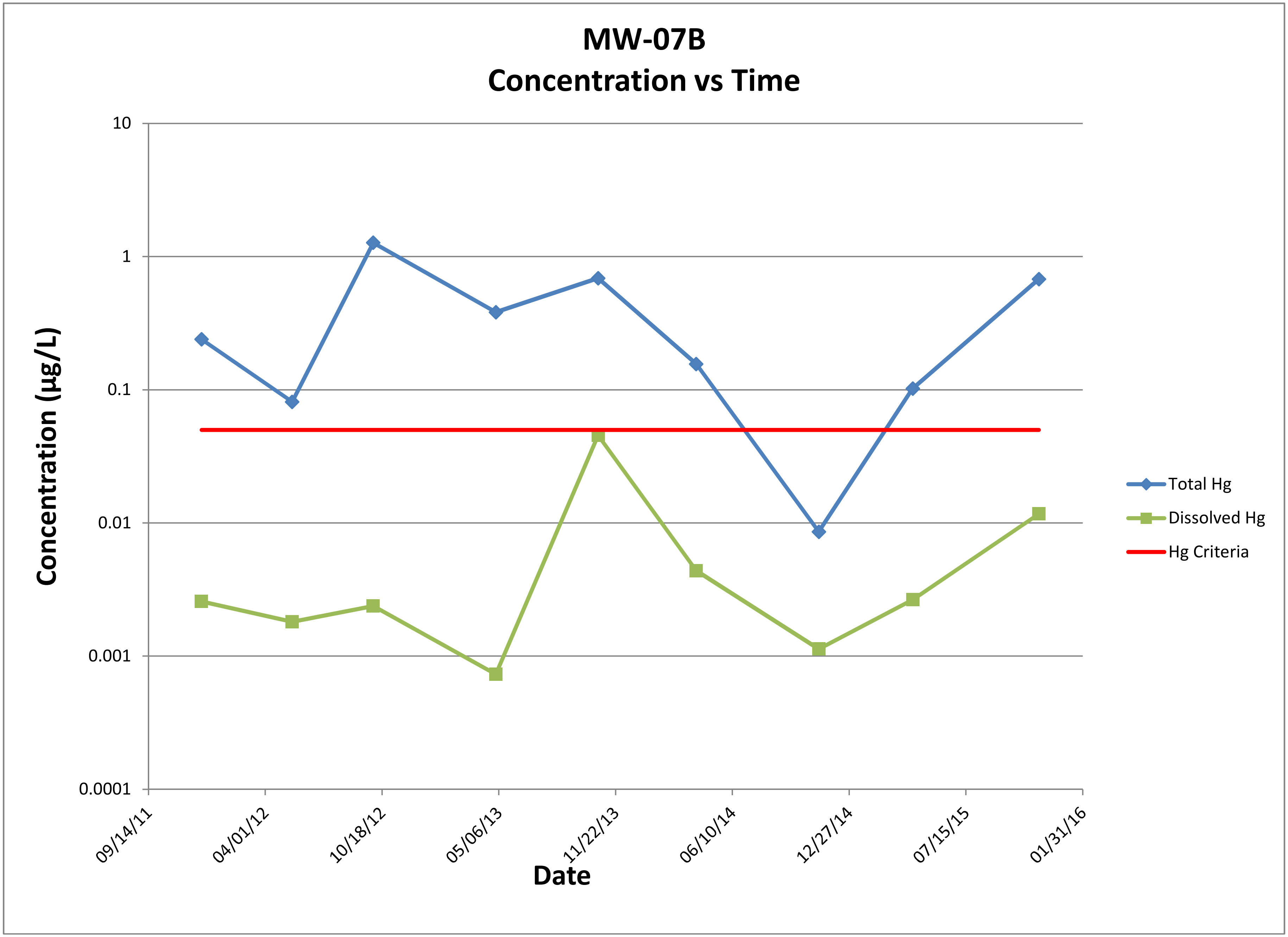


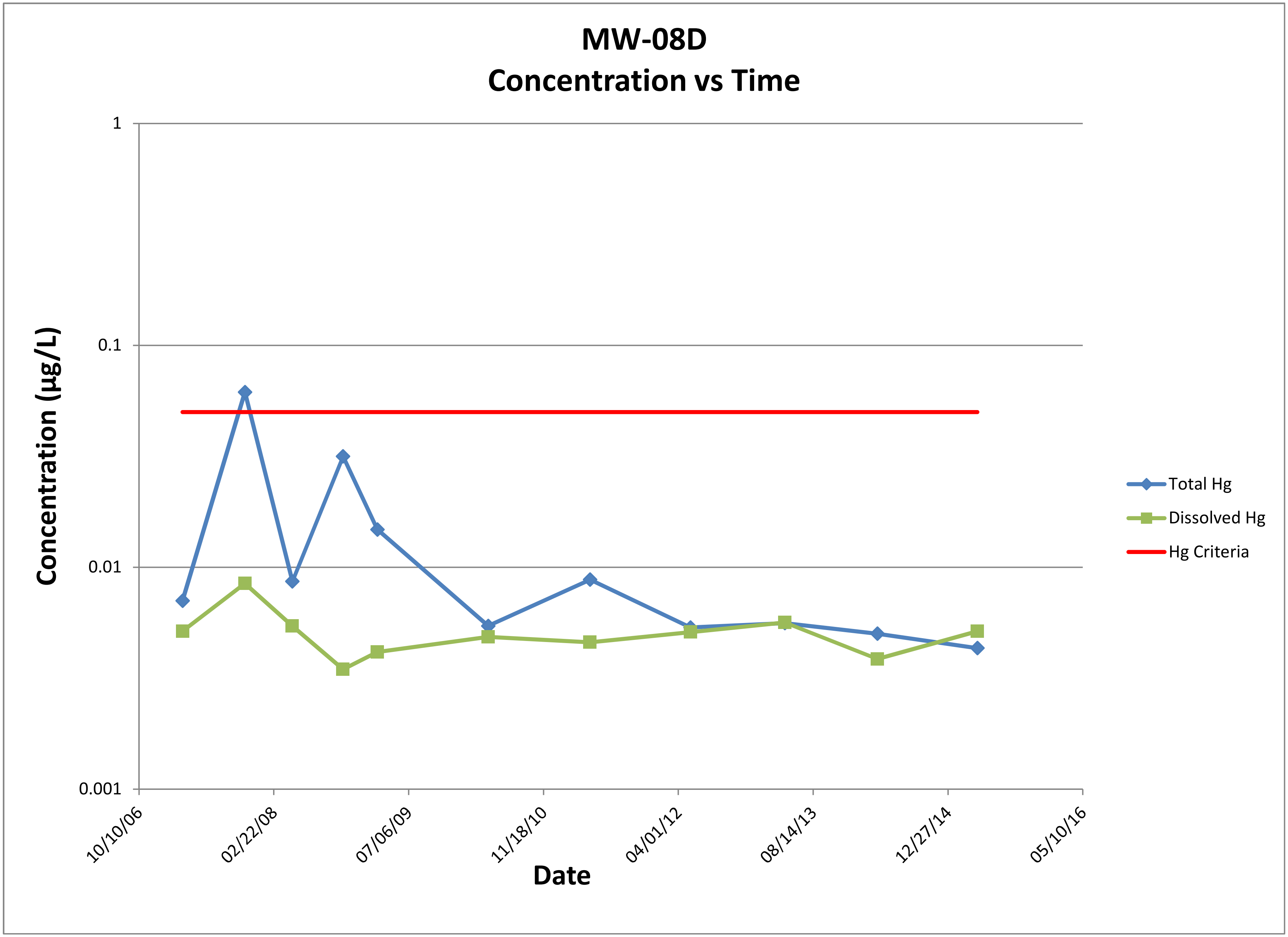
MW-05
Concentration vs Time
Concentration (µg/L)
10
1
0.1
0.01
0.001
0.0001
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria


MW-06
Concentration vs Time
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
Concentration (µg/L)
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
Date
Total Hg
Dissolved Hg
Hg Criteria

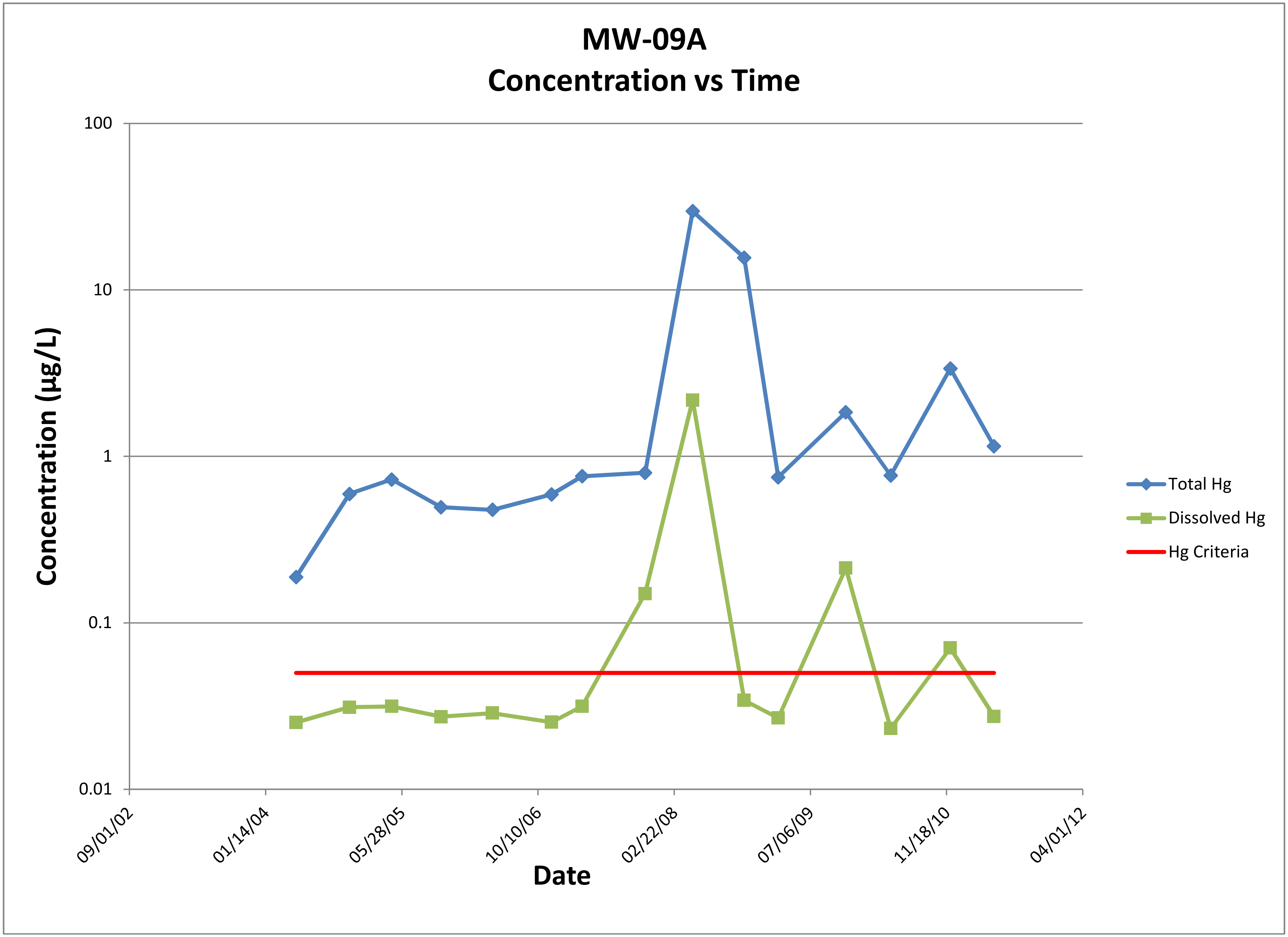

MW-07
Concentration vs Time
Concentration (µg/L)
10
1
0.1
0.01
0.001
0.0001
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
Date
Total Hg
Dissolved Hg
Hg Criteria

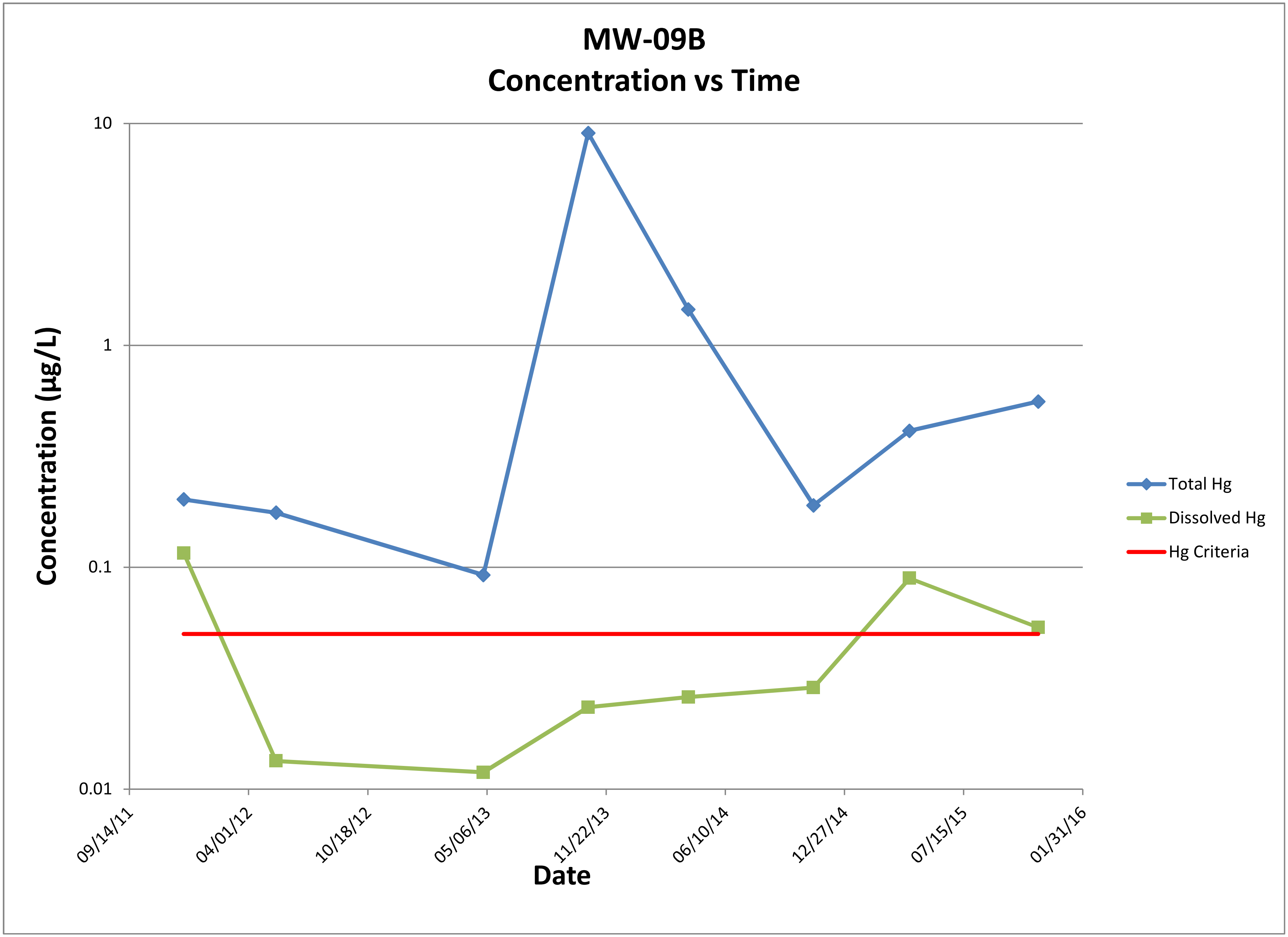

MW-07A
Concentration vs Time
1000
100
10
1
0.1
0.01
0.001
Concentration (µg/L)
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
Date
Total Hg
Dissolved Hg
Hg Criteria


MW-07B
Concentration vs Time
10
1
0.1
0.01
0.001
0.0001
Concentration (µg/L)
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
06/10/14
12/27/14
07/15/15
01/31/16
Date
Total Hg
Dissolved Hg
Hg Criteria

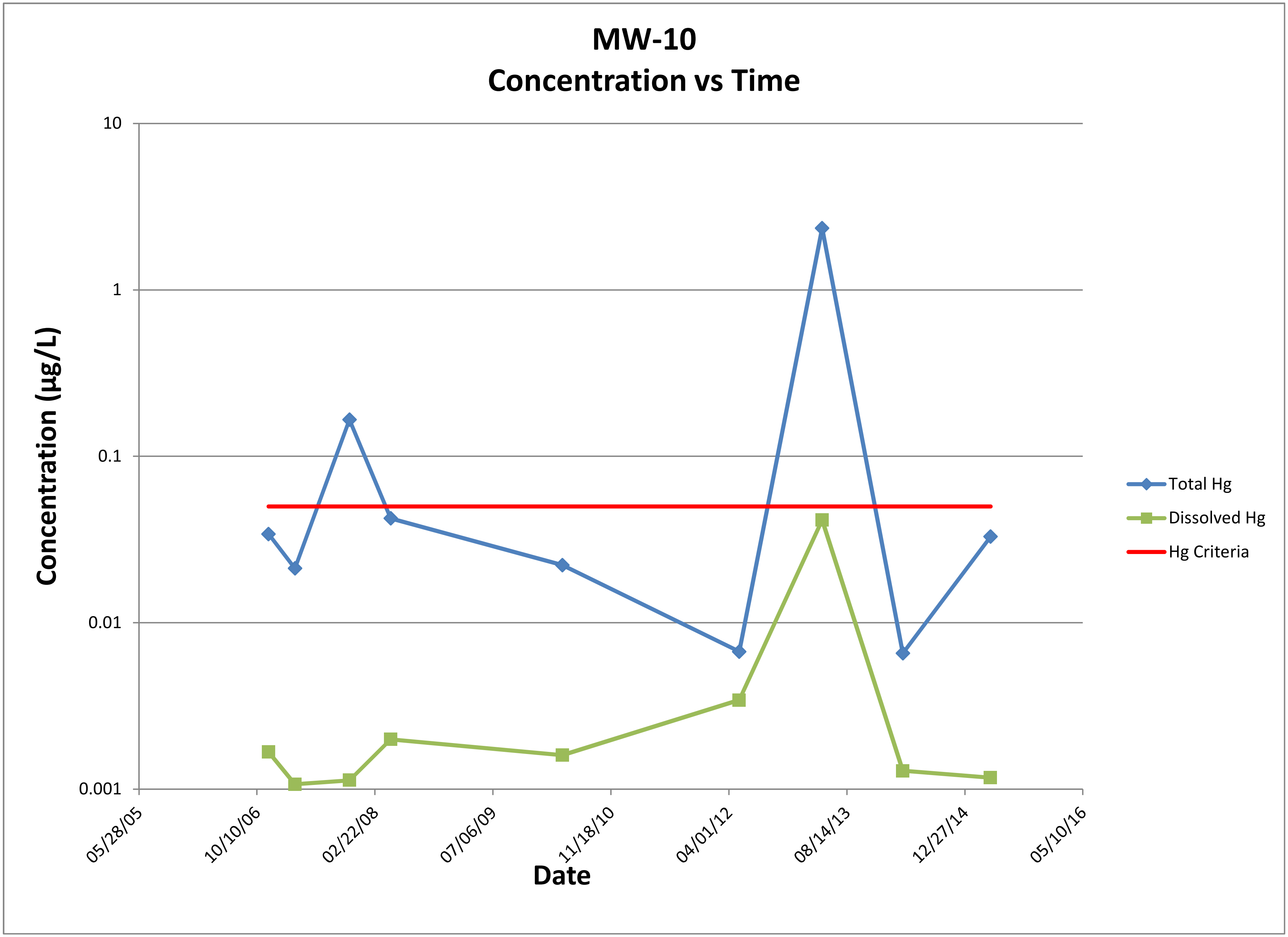


MW-08D
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
Date
Total Hg
Dissolved Hg
Hg Criteria

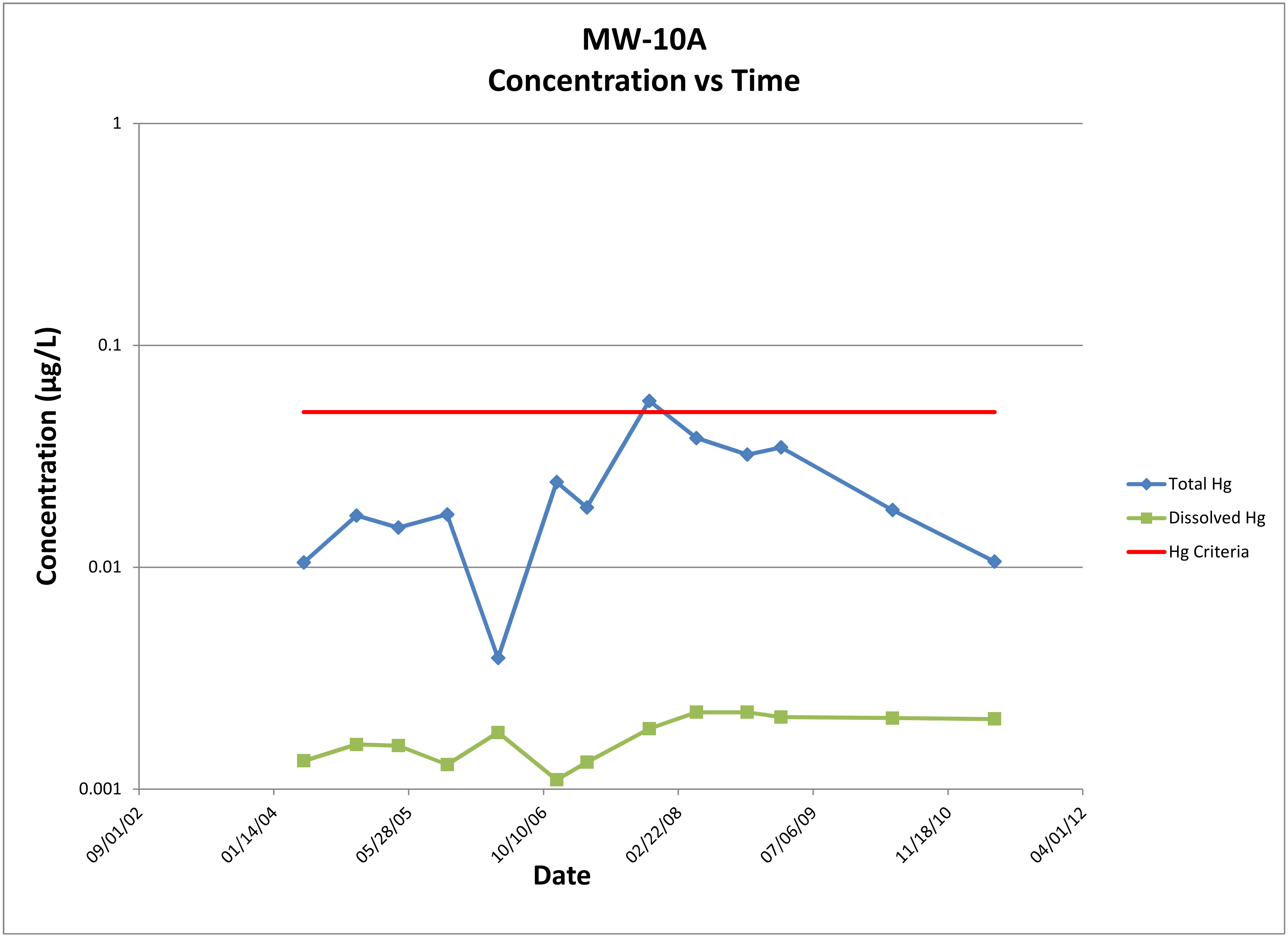

MW-09A
Concentration vs Time
100
10
1
0.1
0.01
Concentration (µg/L)
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
Date
Total Hg
Dissolved Hg
Hg Criteria

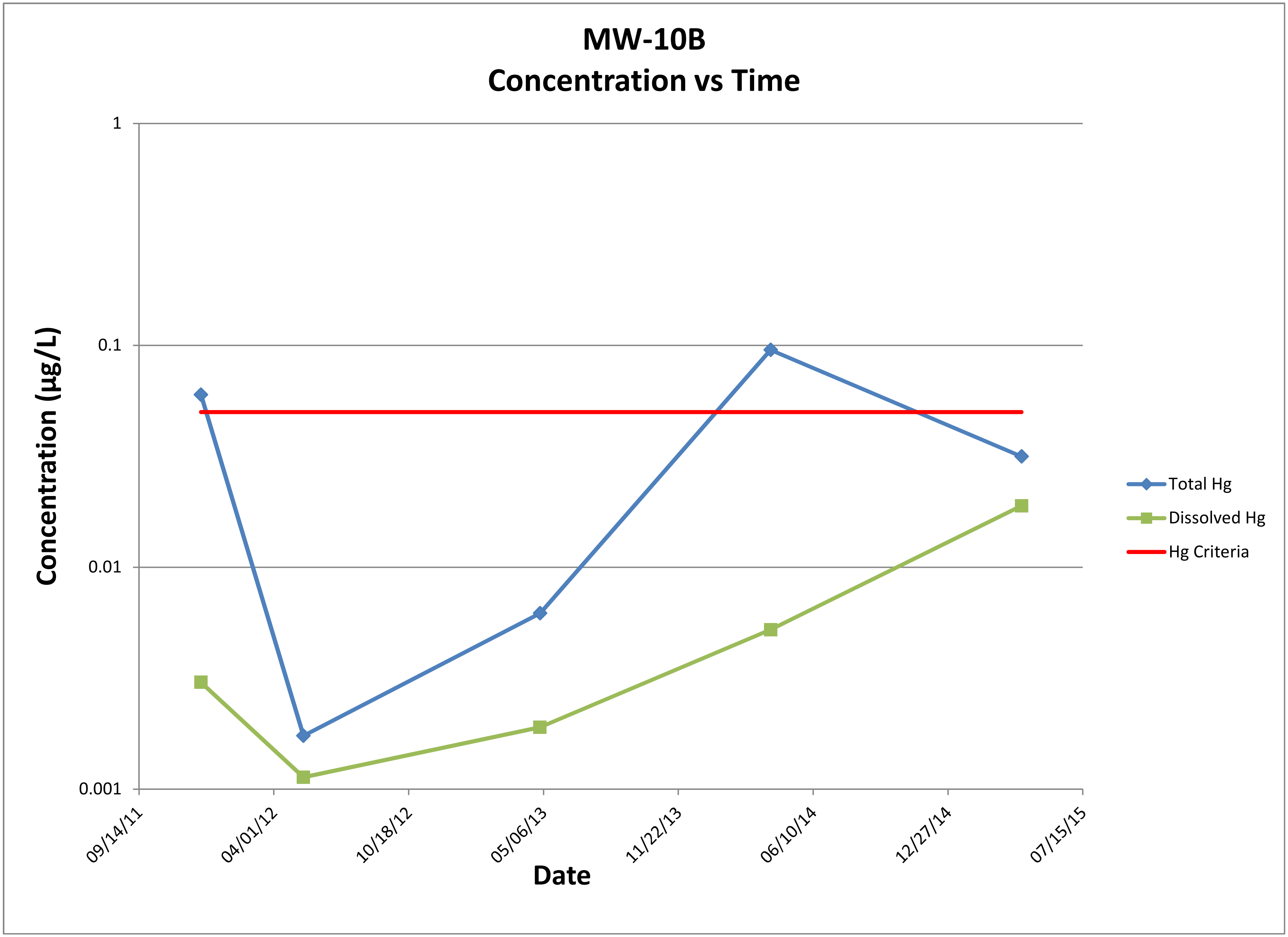


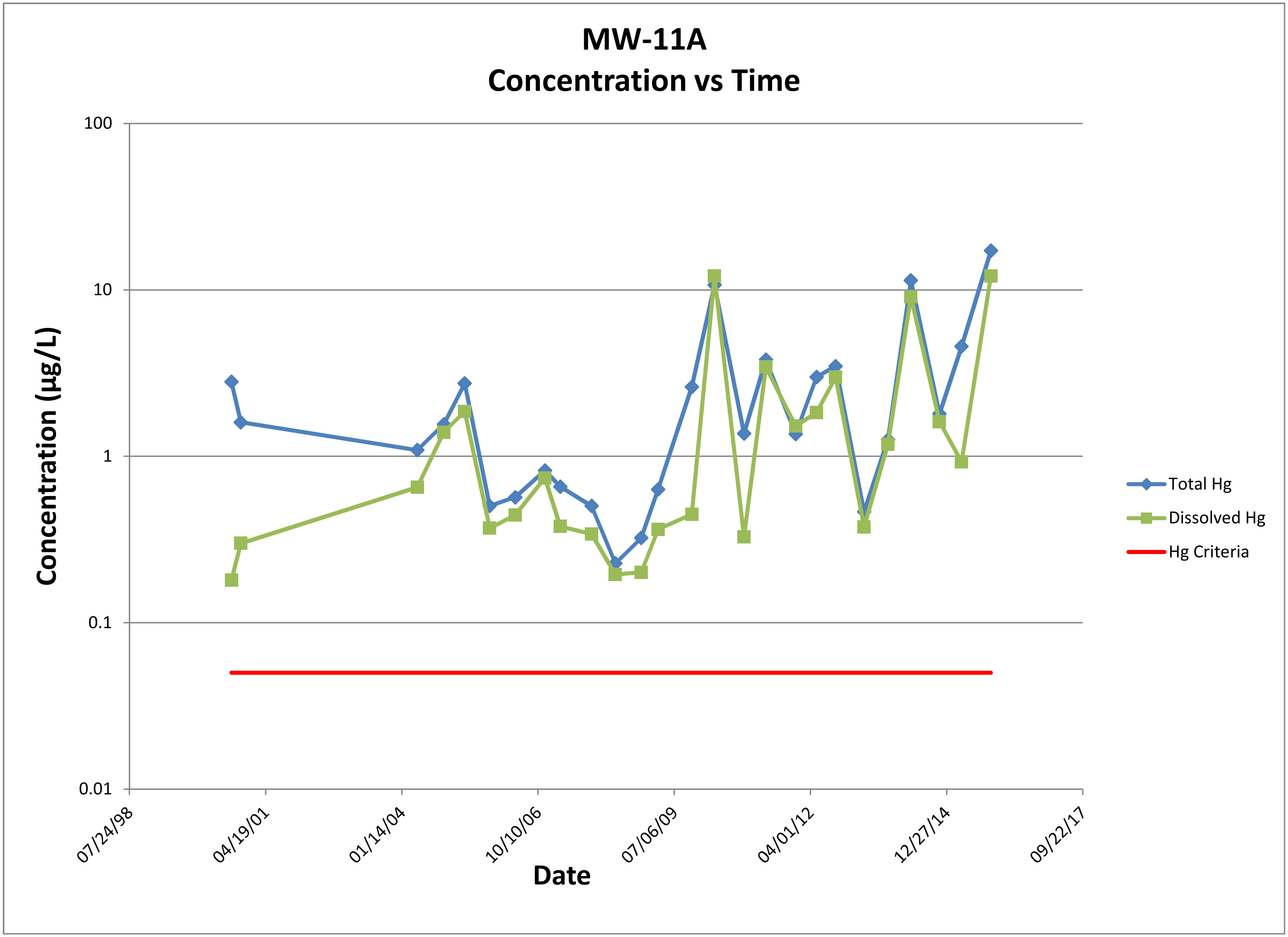
MW-09B
Concentration vs Time
10
1
0.1
0.01
Concentration (µg/L)
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
06/10/14
12/27/14
07/15/15
01/31/16
Date
Total Hg
Dissolved Hg
Hg Criteria

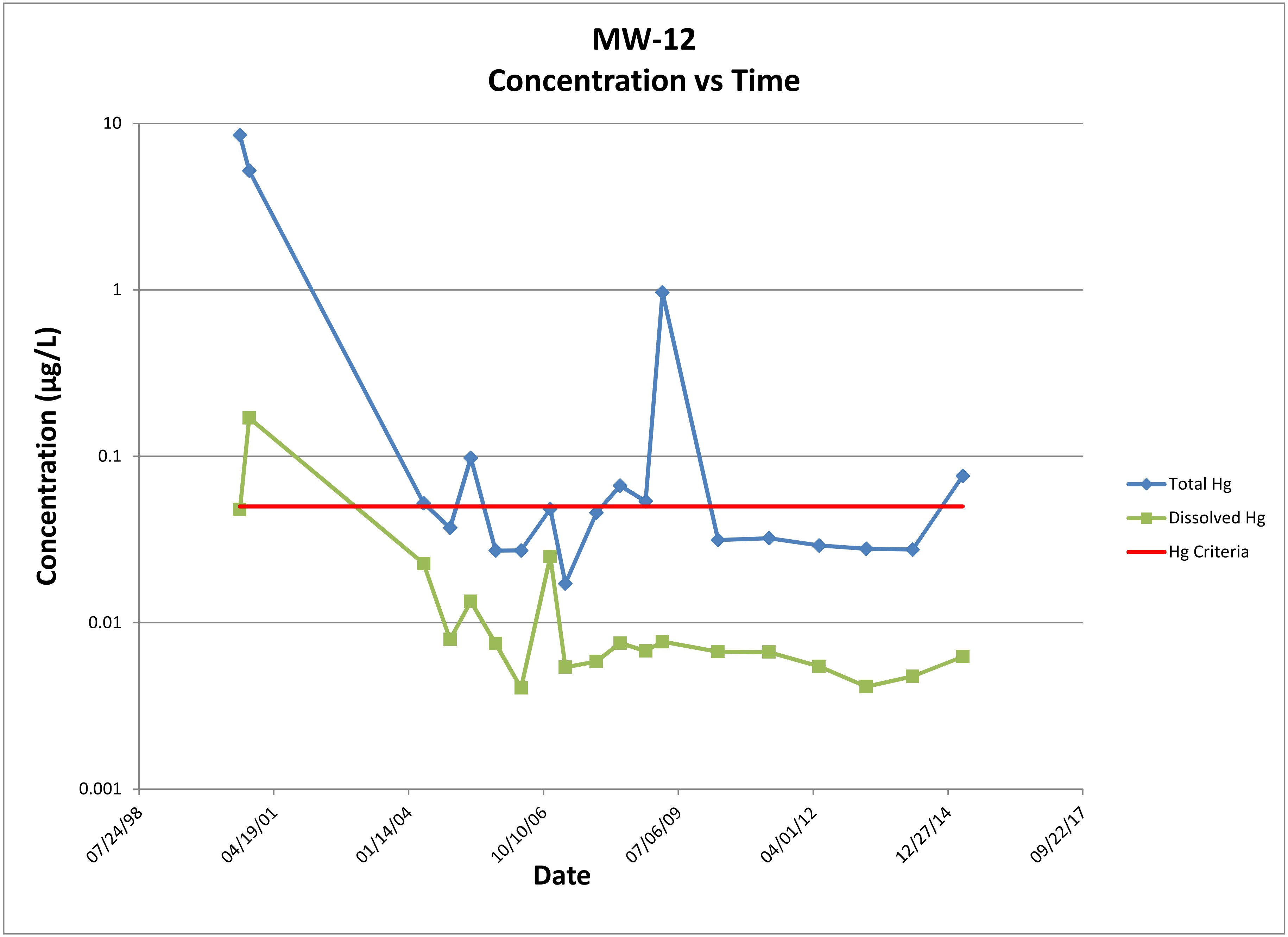


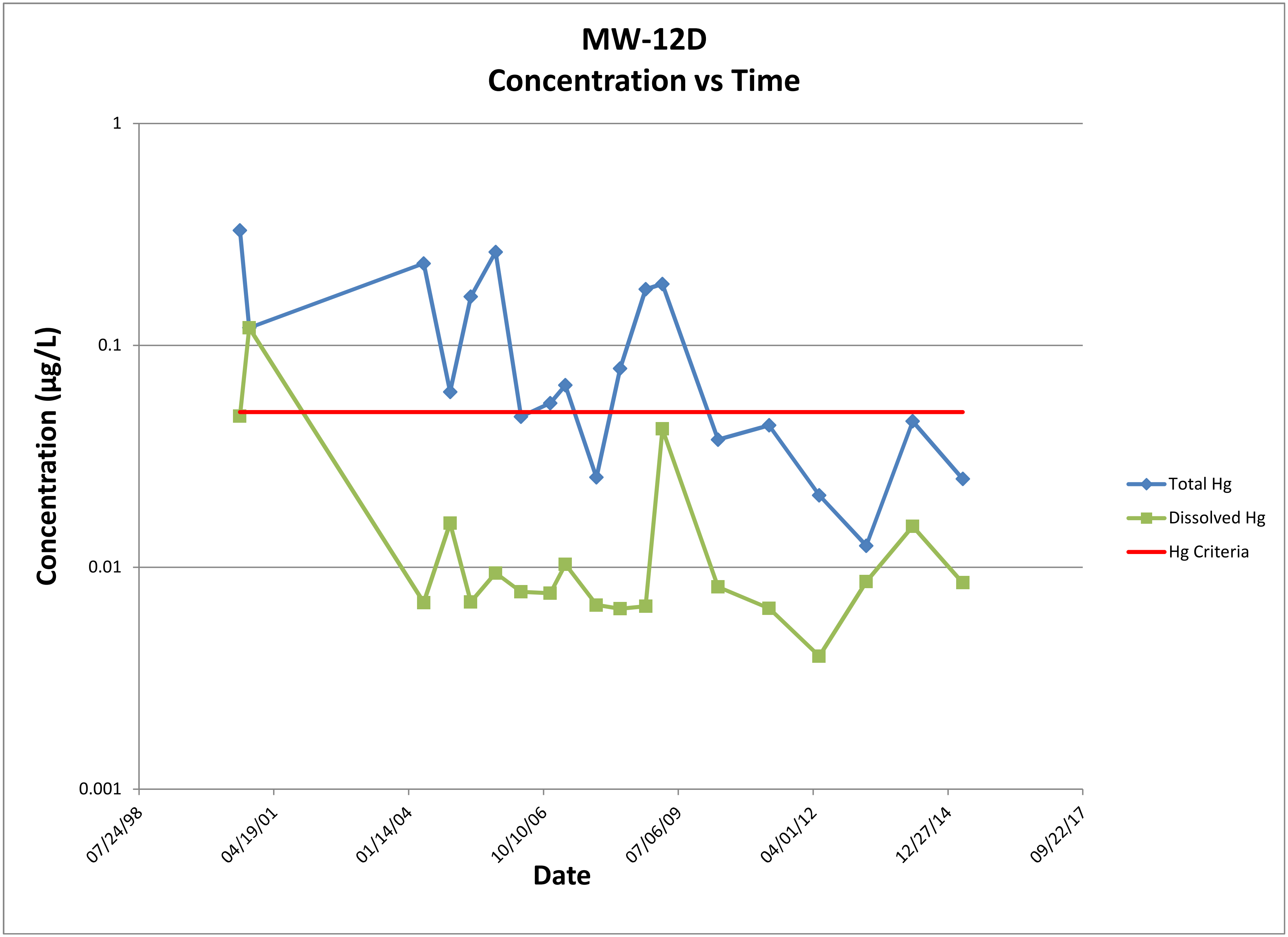
MW-10
Concentration vs Time
Concentration (µg/L)
10
1
0.1
0.01
0.001
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
Date
Total Hg
Dissolved Hg
Hg Criteria


MW-10A
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
Date
Total Hg
Dissolved Hg
Hg Criteria

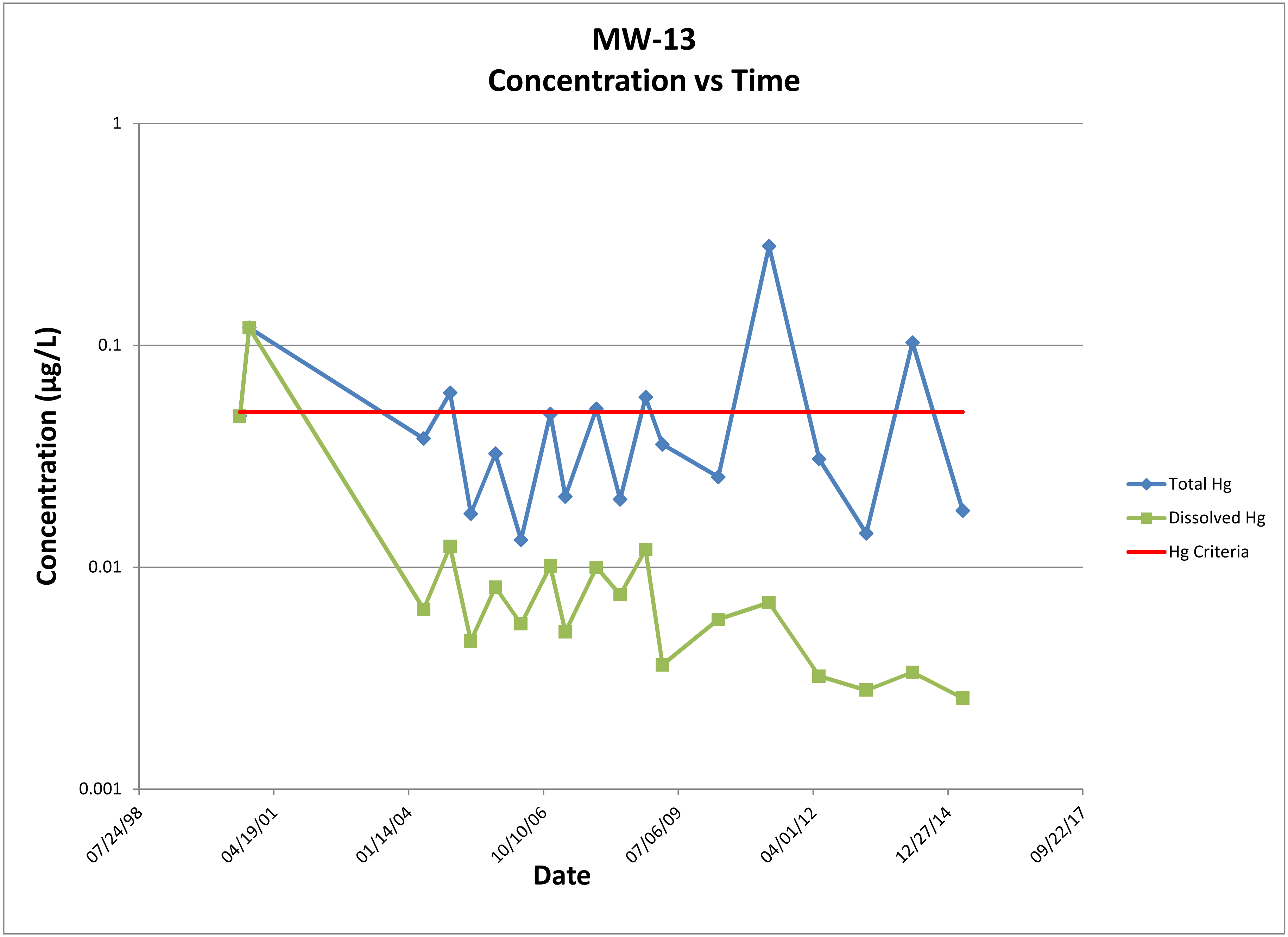

MW-10B
Concentration vs Time
1
0.1
0.01
0.001
Concentration (µg/L)
09/14/11
04/01/12
10/18/12
05/06/13
11/22/13
06/10/14
12/27/14
07/15/15
Date
Total Hg
Dissolved Hg
Hg Criteria

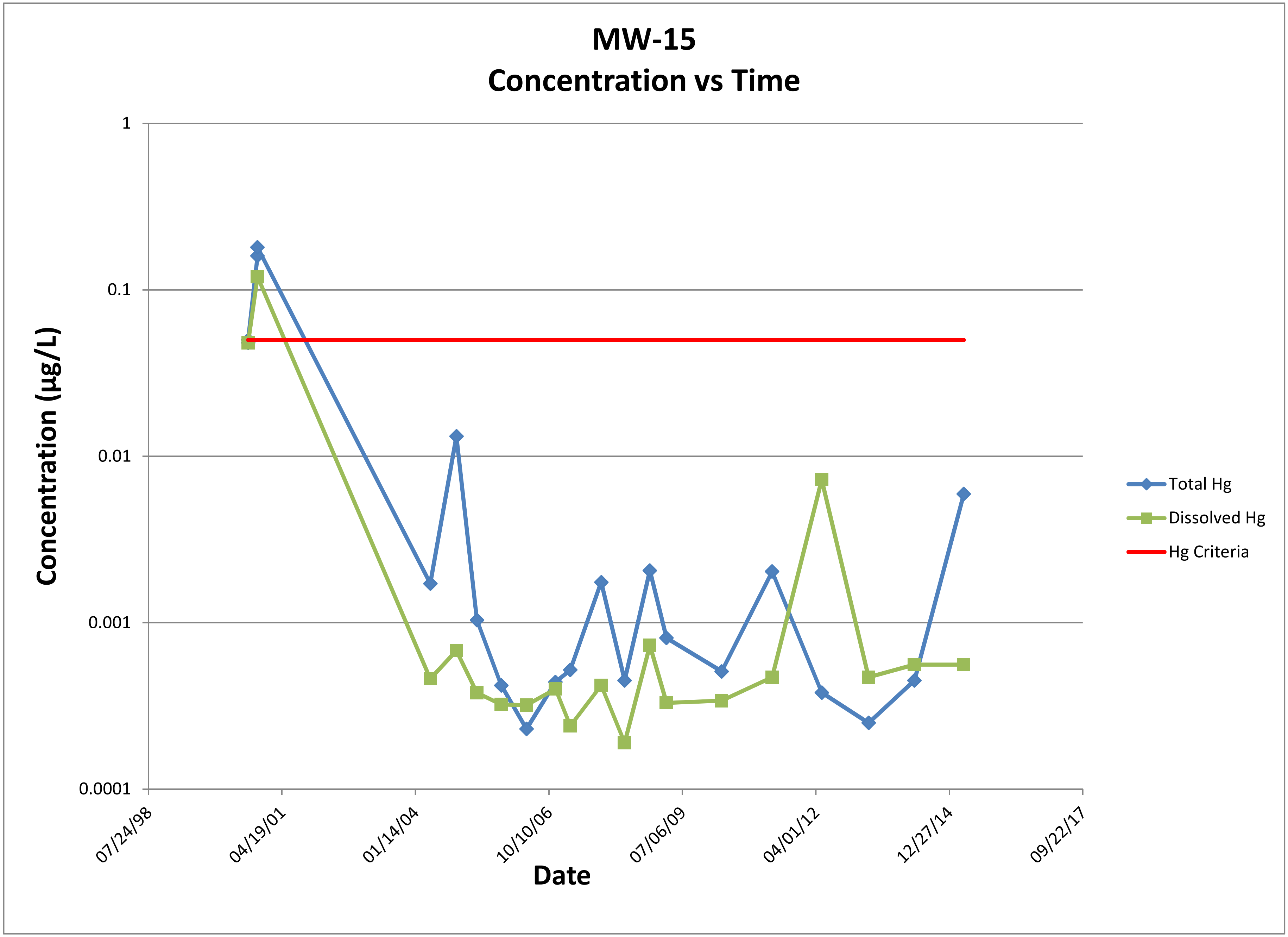

MW-11A
Concentration vs Time
100
10
1
0.1
0.01
Concentration (µg/L)
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria

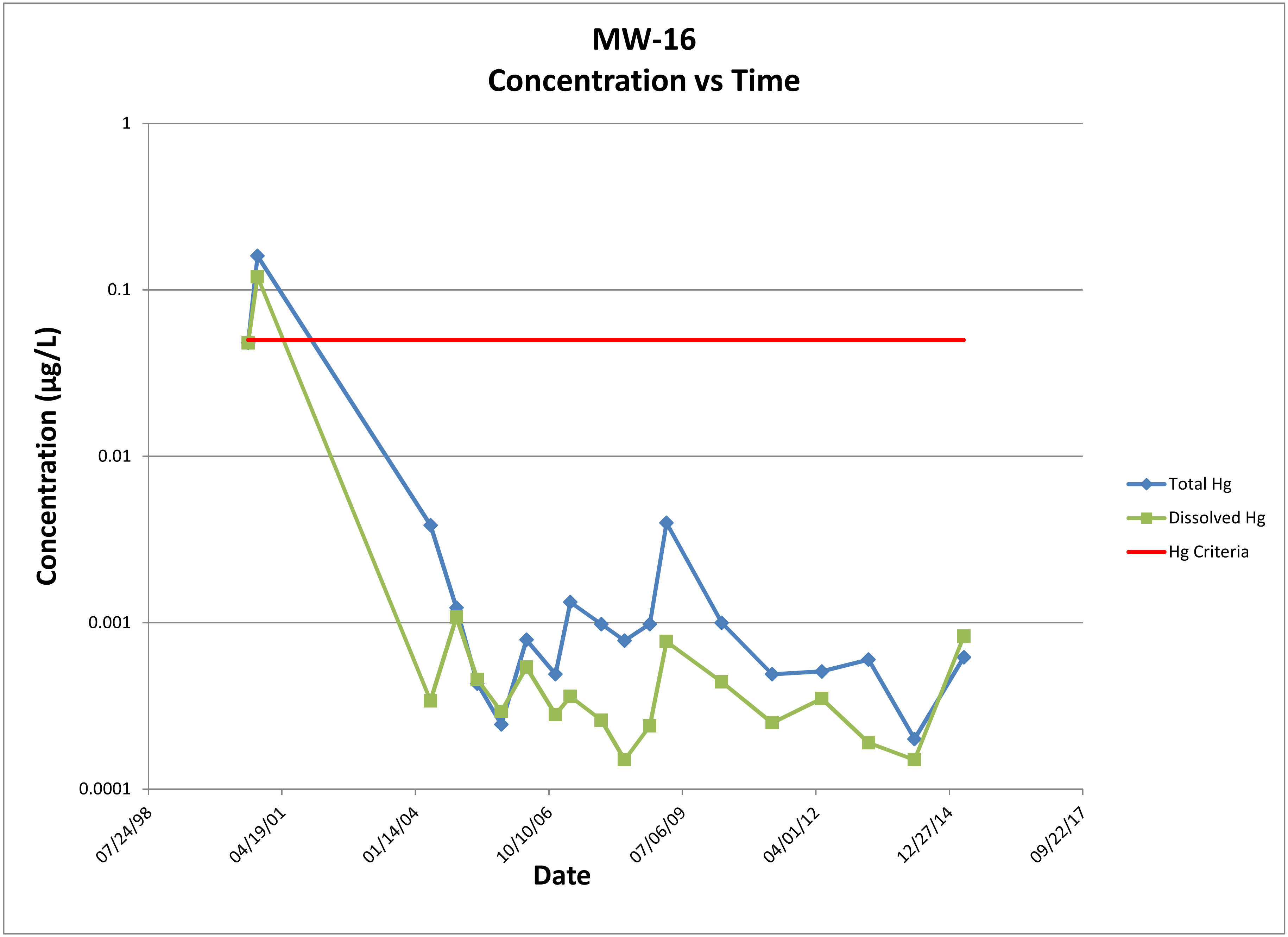

MW-12
Concentration vs Time
10
1
0.1
0.01
0.001
Concentration (µg/L)
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria

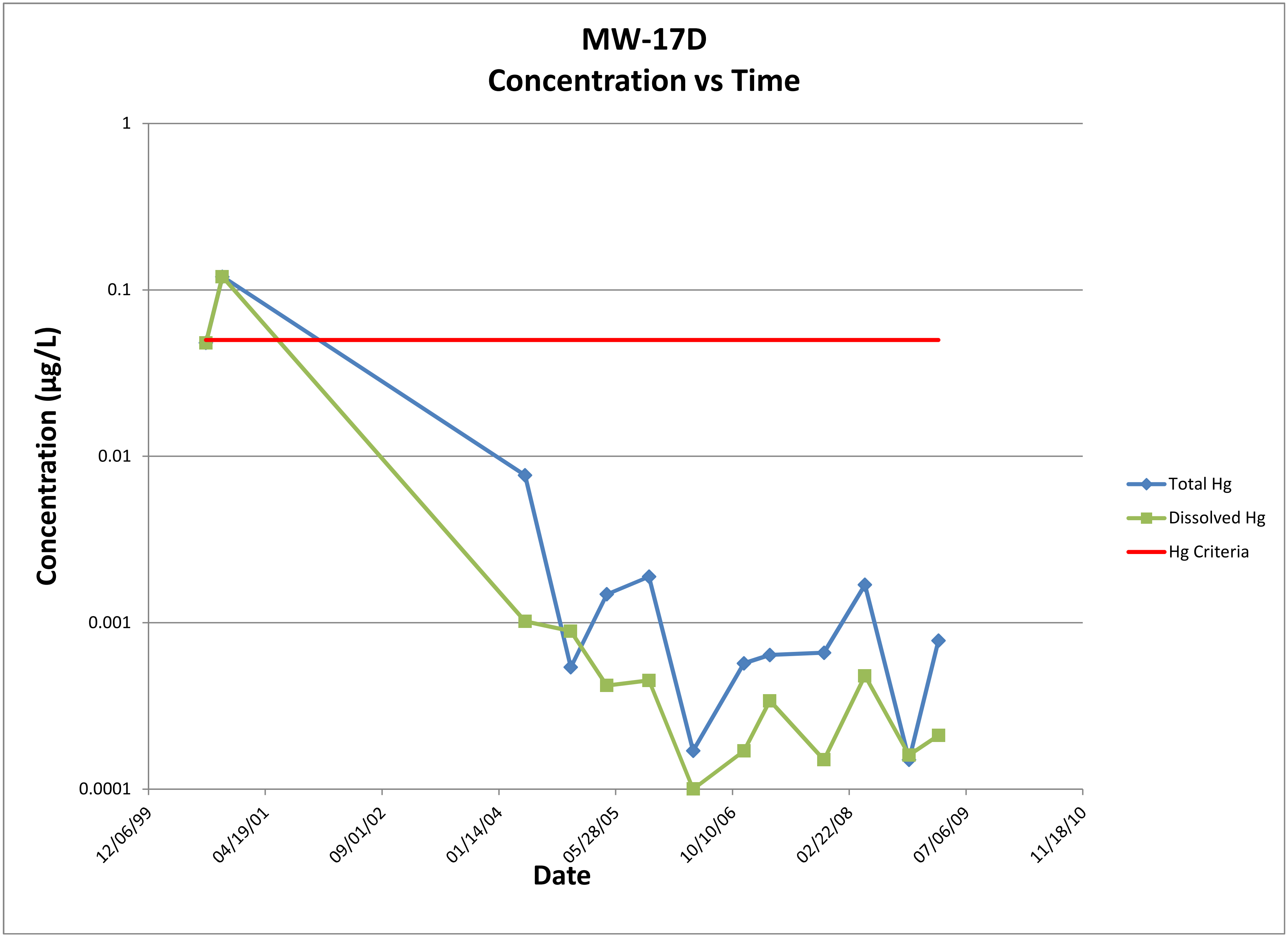


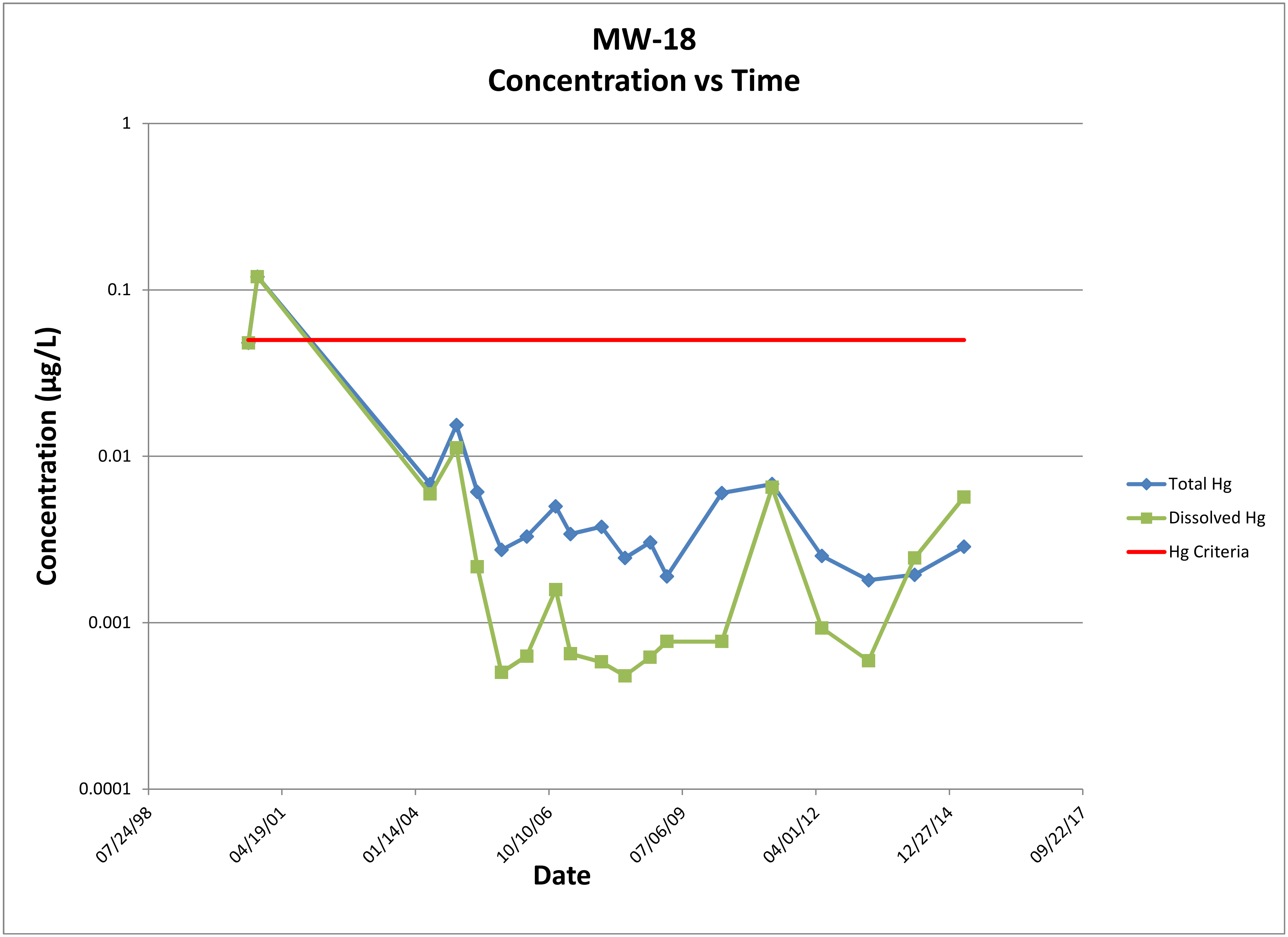
MW-12D
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria

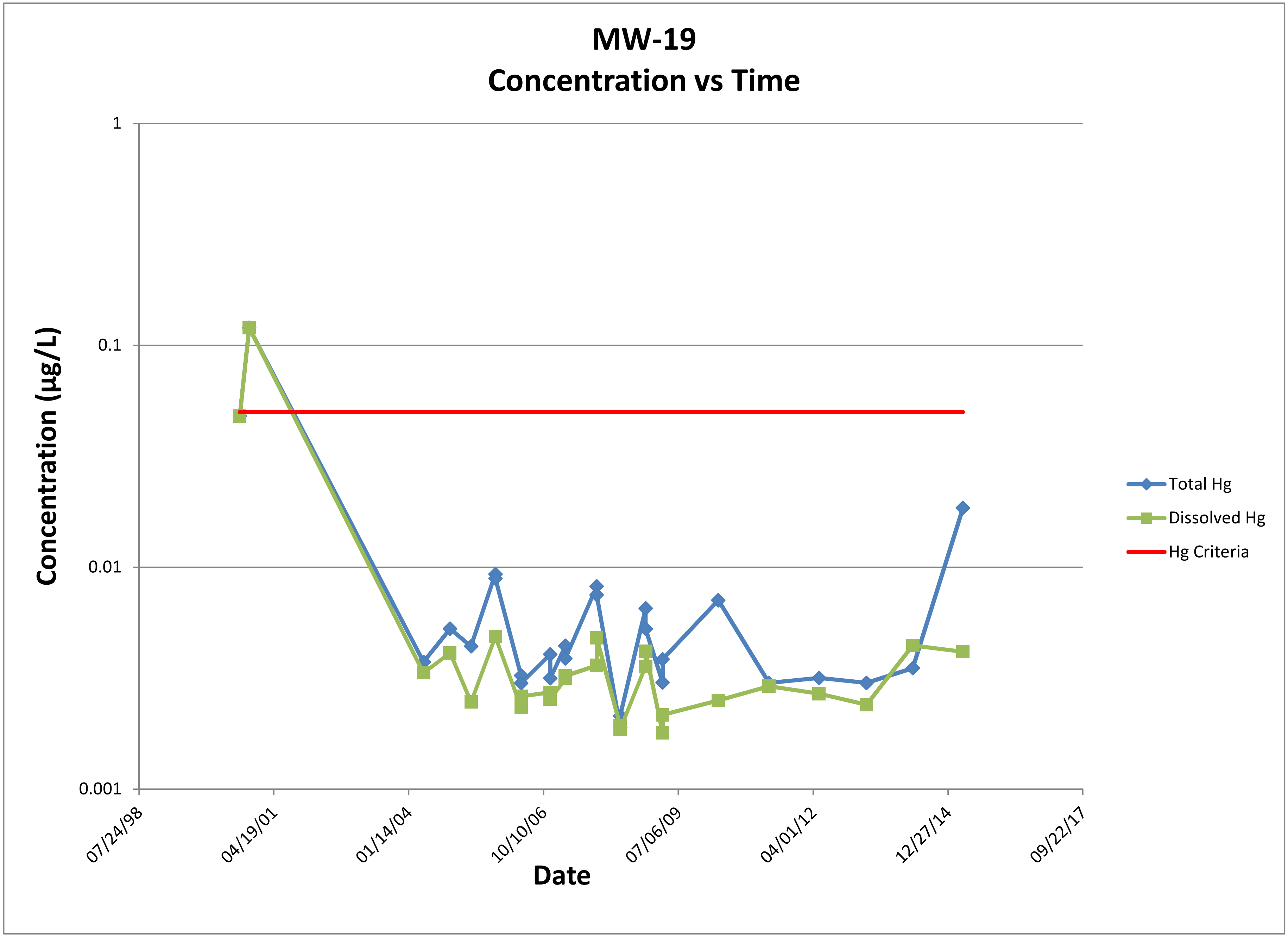

MW-13
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria


MW-15
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
0.0001
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria

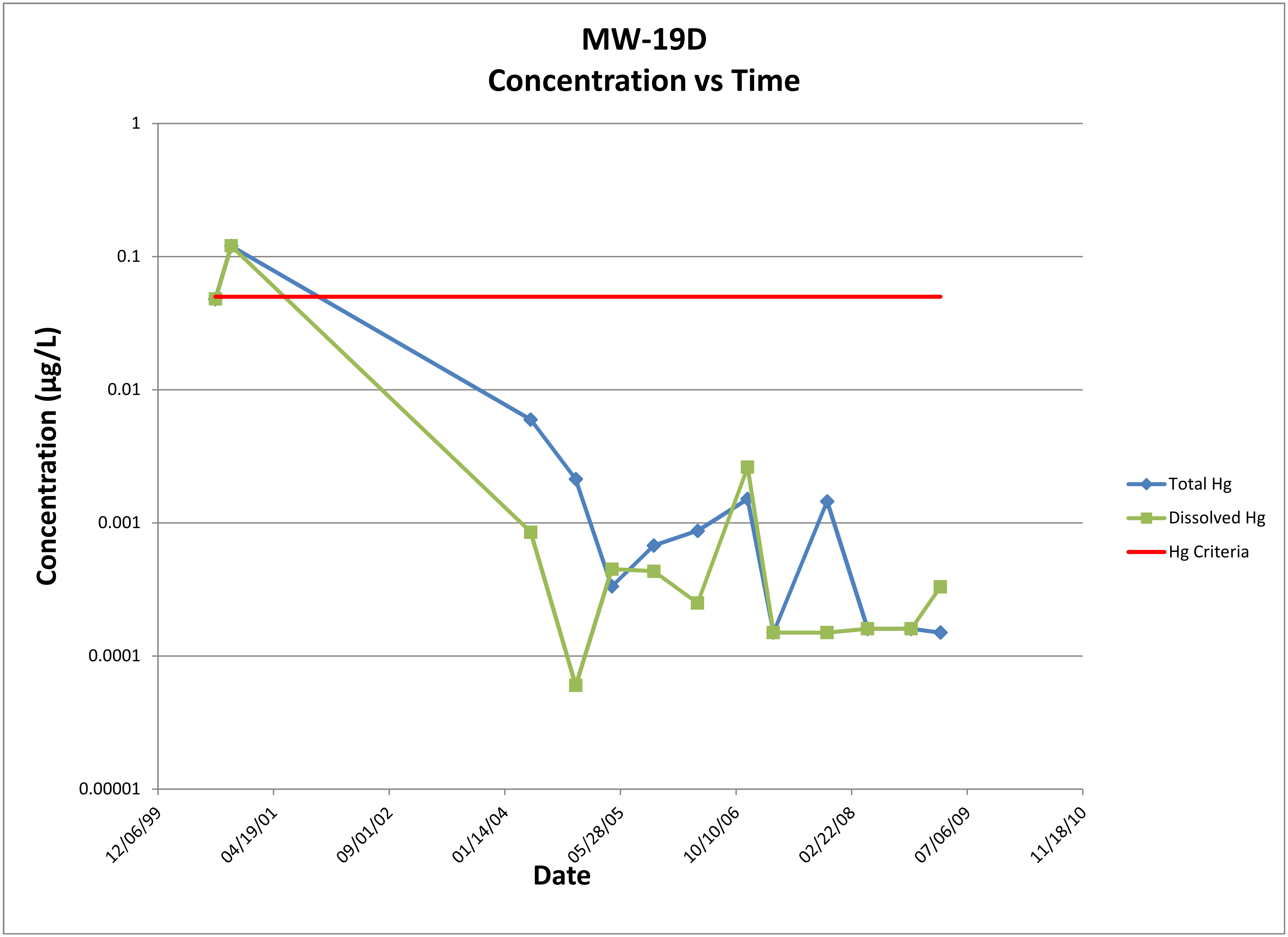

MW-16
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
0.0001
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria


MW-17D
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
0.0001
12/06/99
04/19/01
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
Date
Total Hg
Dissolved Hg
Hg Criteria

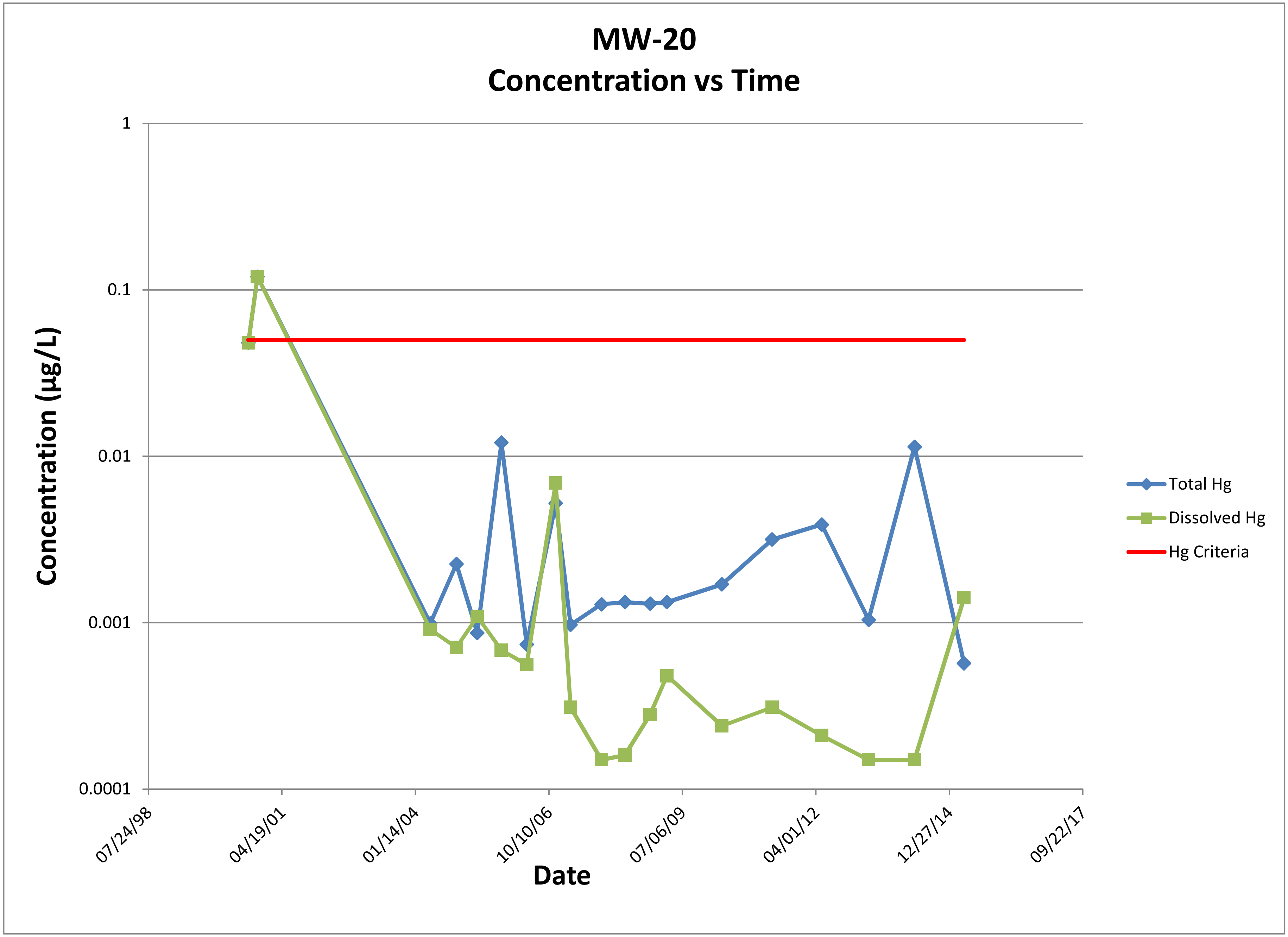

MW-18
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
0.0001
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria



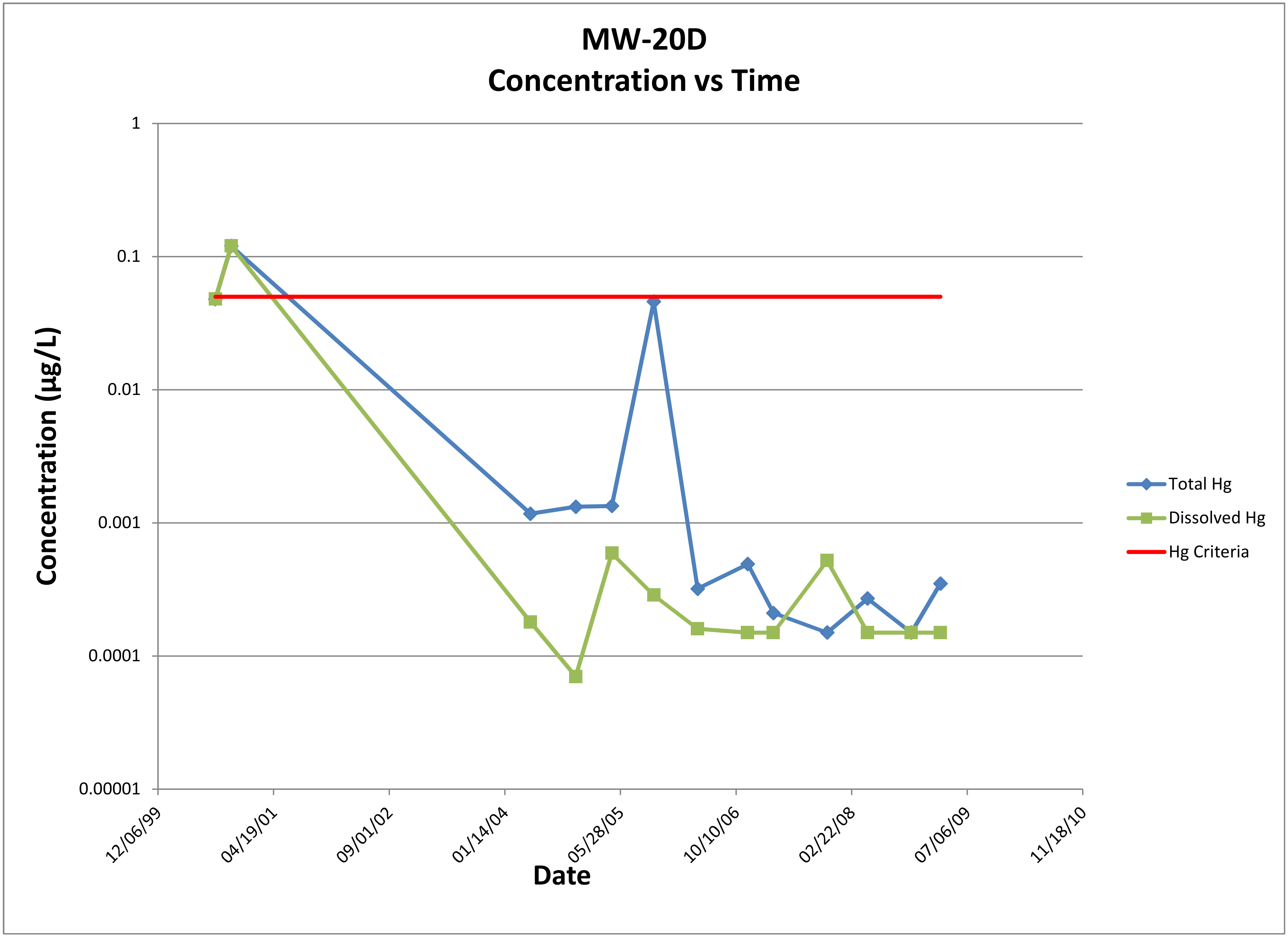
MW-19
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria

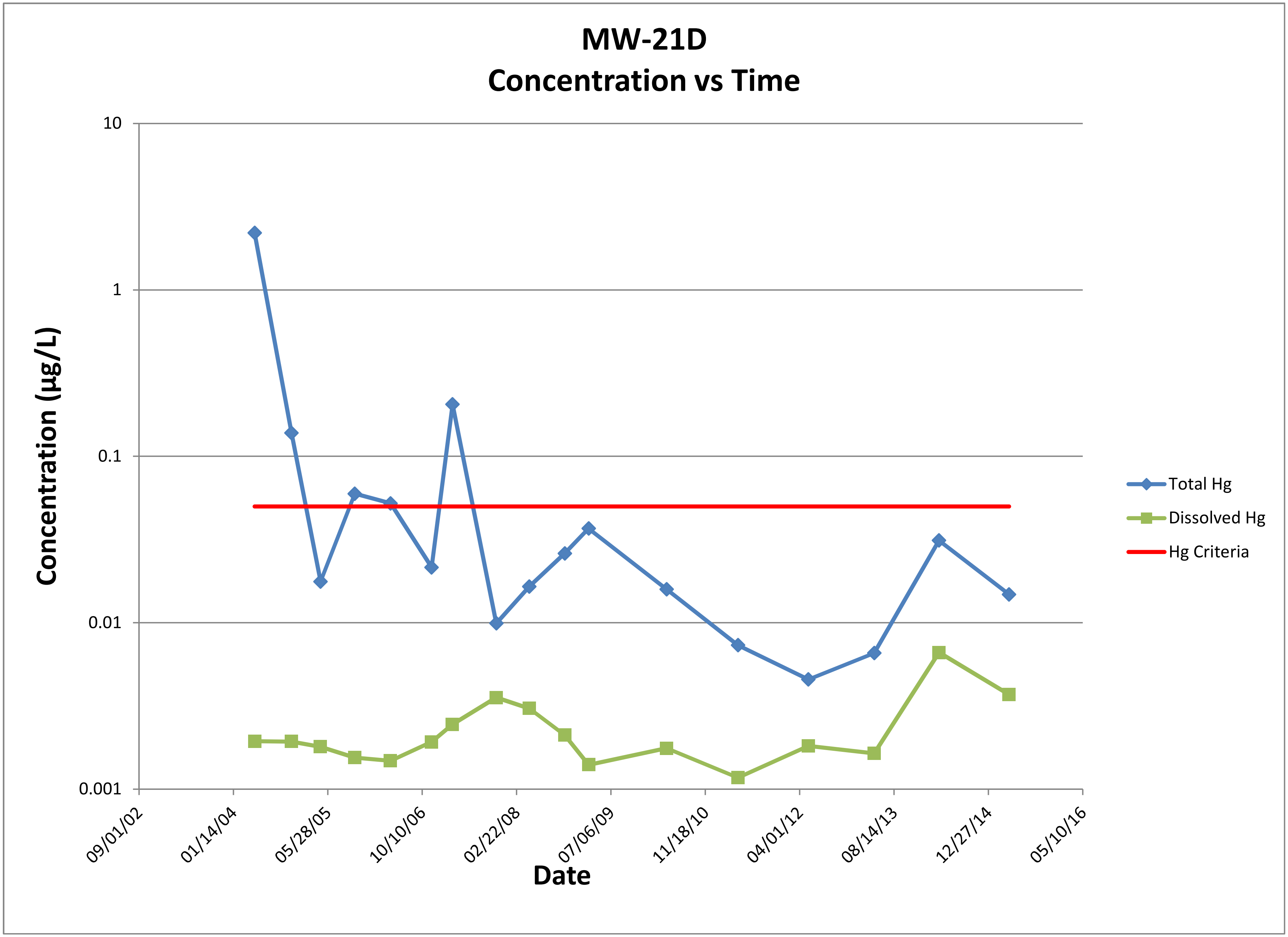


MW-19D
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
0.0001
0.00001
12/06/99
04/19/01
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
Date
Total Hg
Dissolved Hg
Hg Criteria

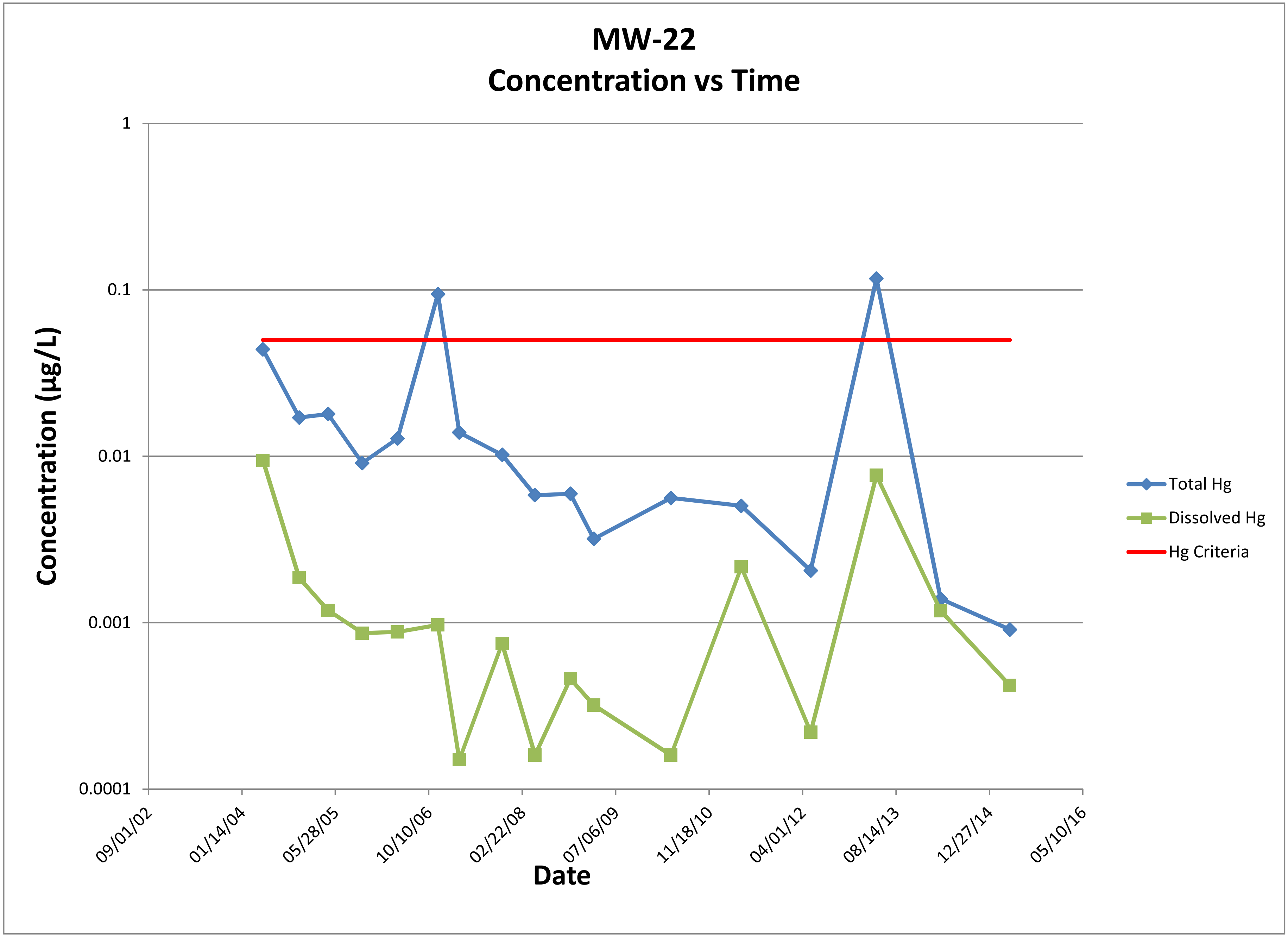


MW-20
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
0.0001
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria

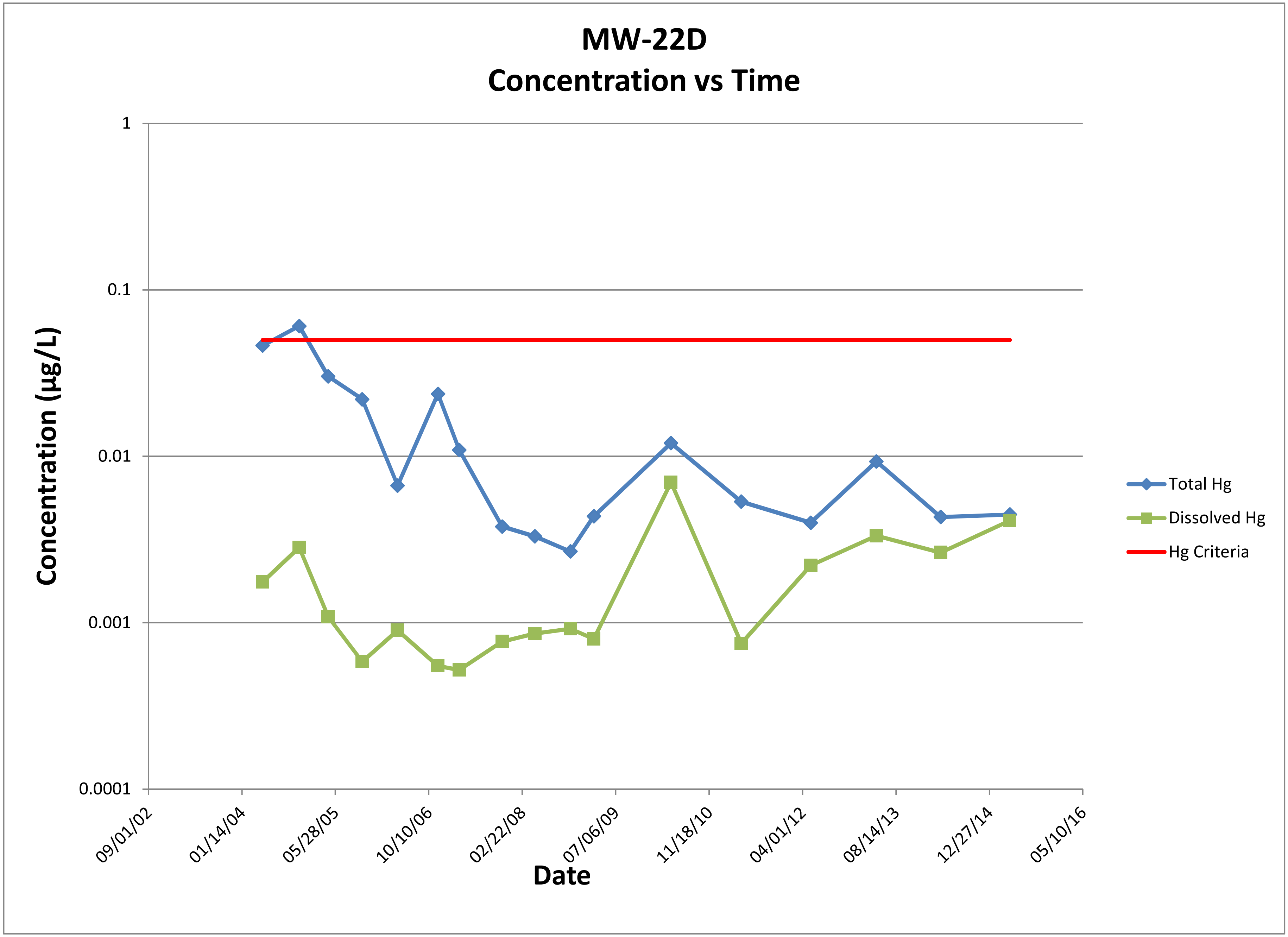

MW-20D
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
0.0001
0.00001
12/06/99
04/19/01
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
Date
Total Hg
Dissolved Hg
Hg Criteria

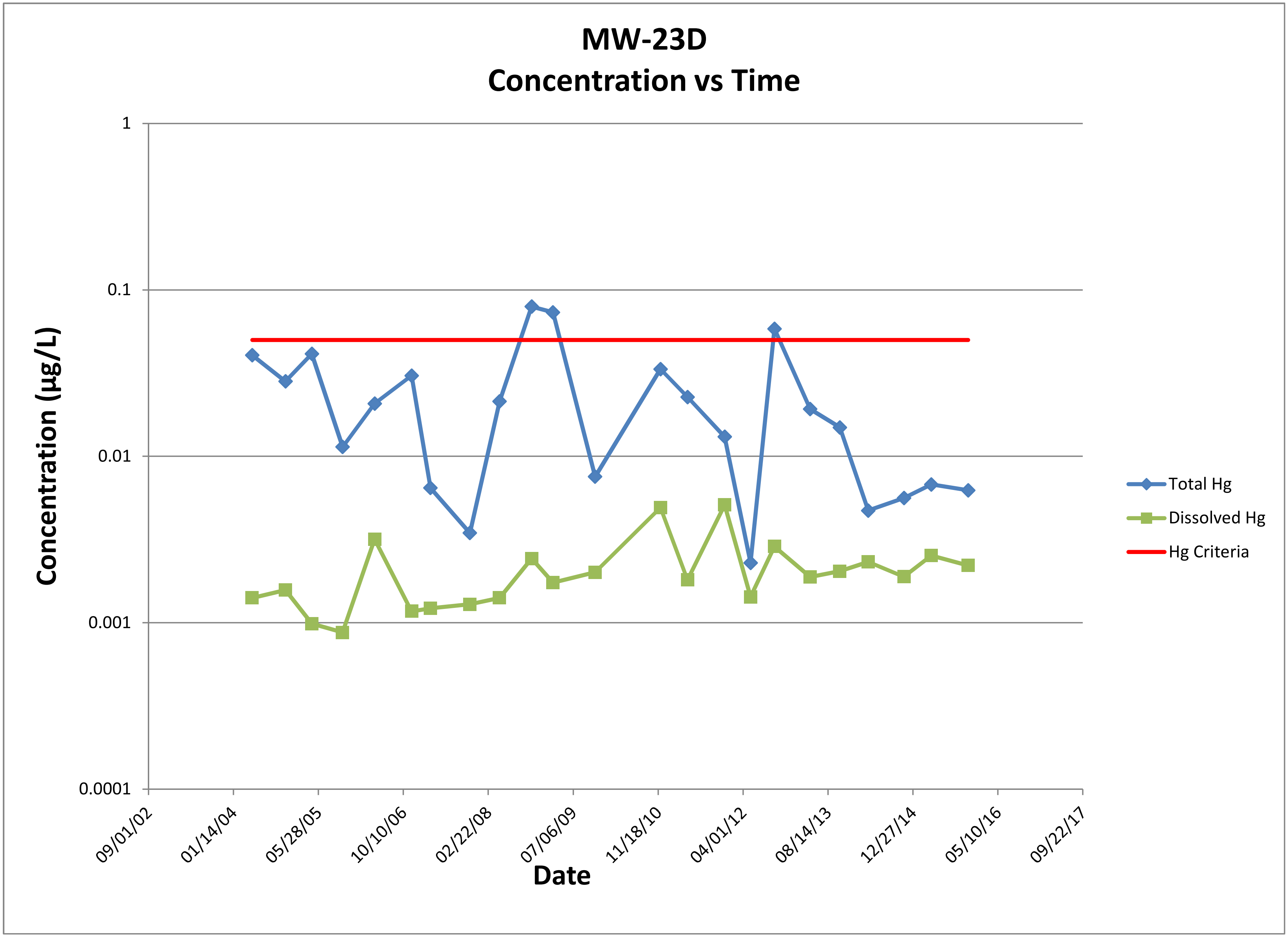


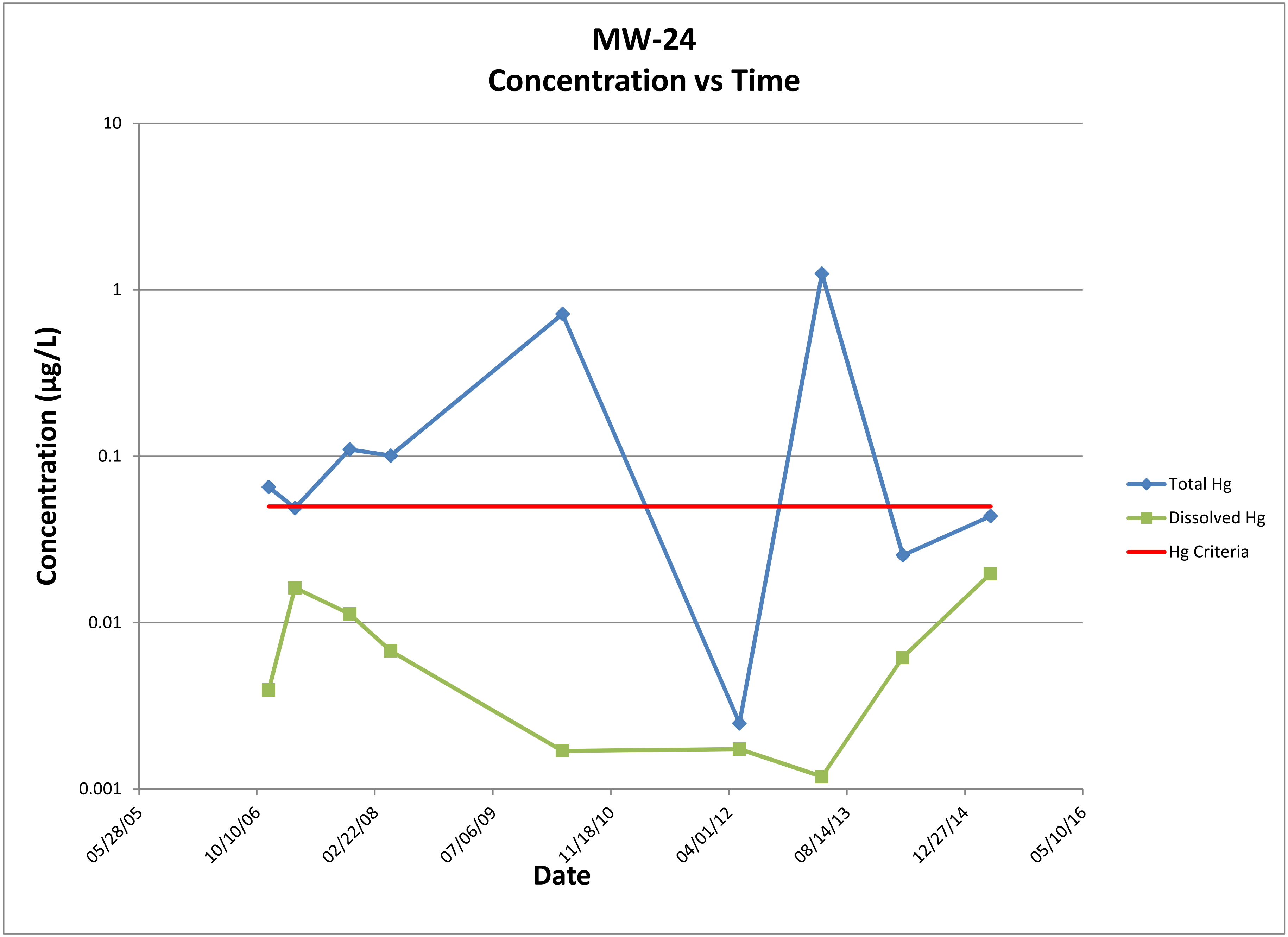
MW-21D
Concentration vs Time
Concentration (µg/L)
10
1
0.1
0.01
0.001
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
Date
Total Hg
Dissolved Hg
Hg Criteria

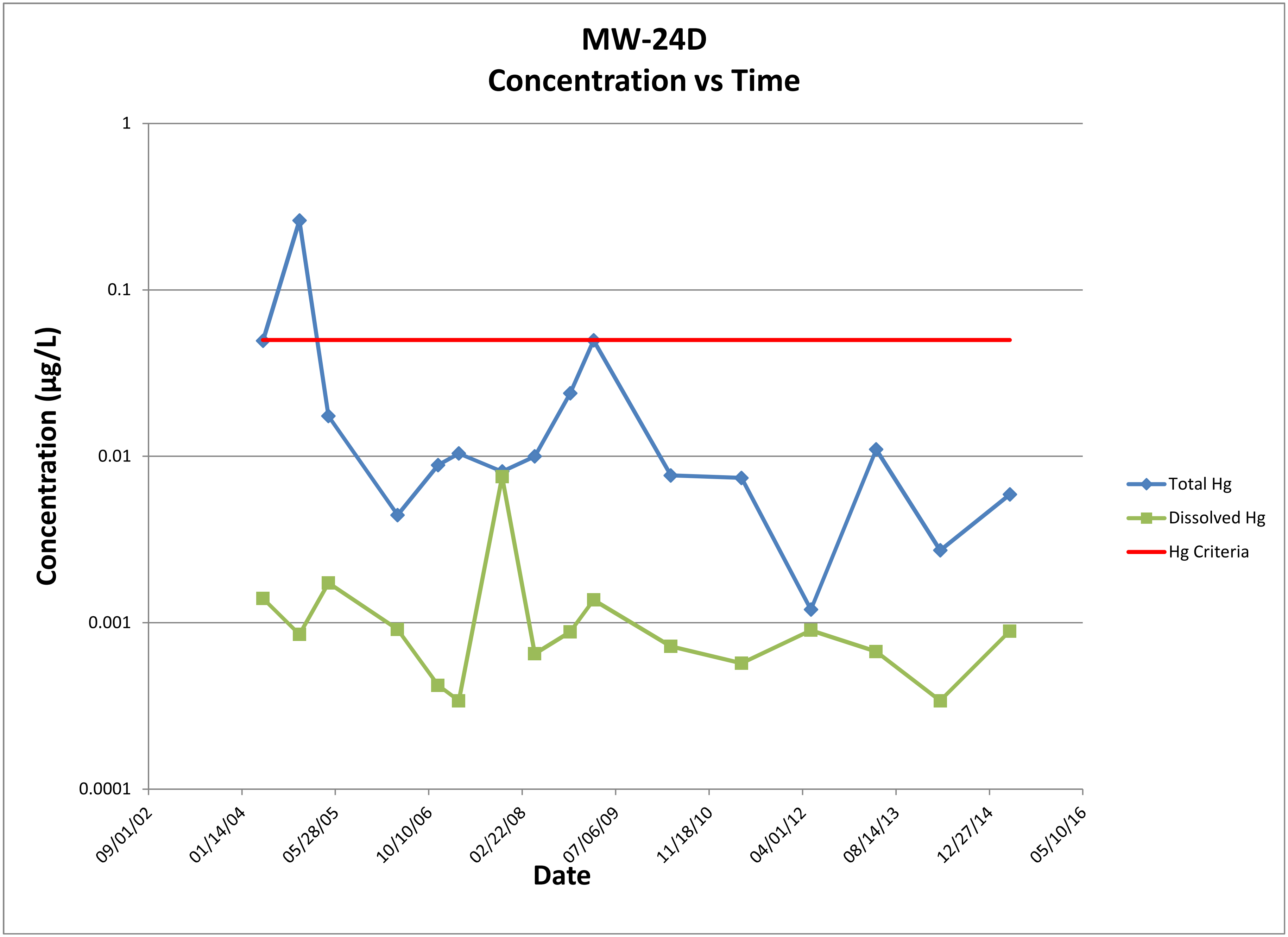


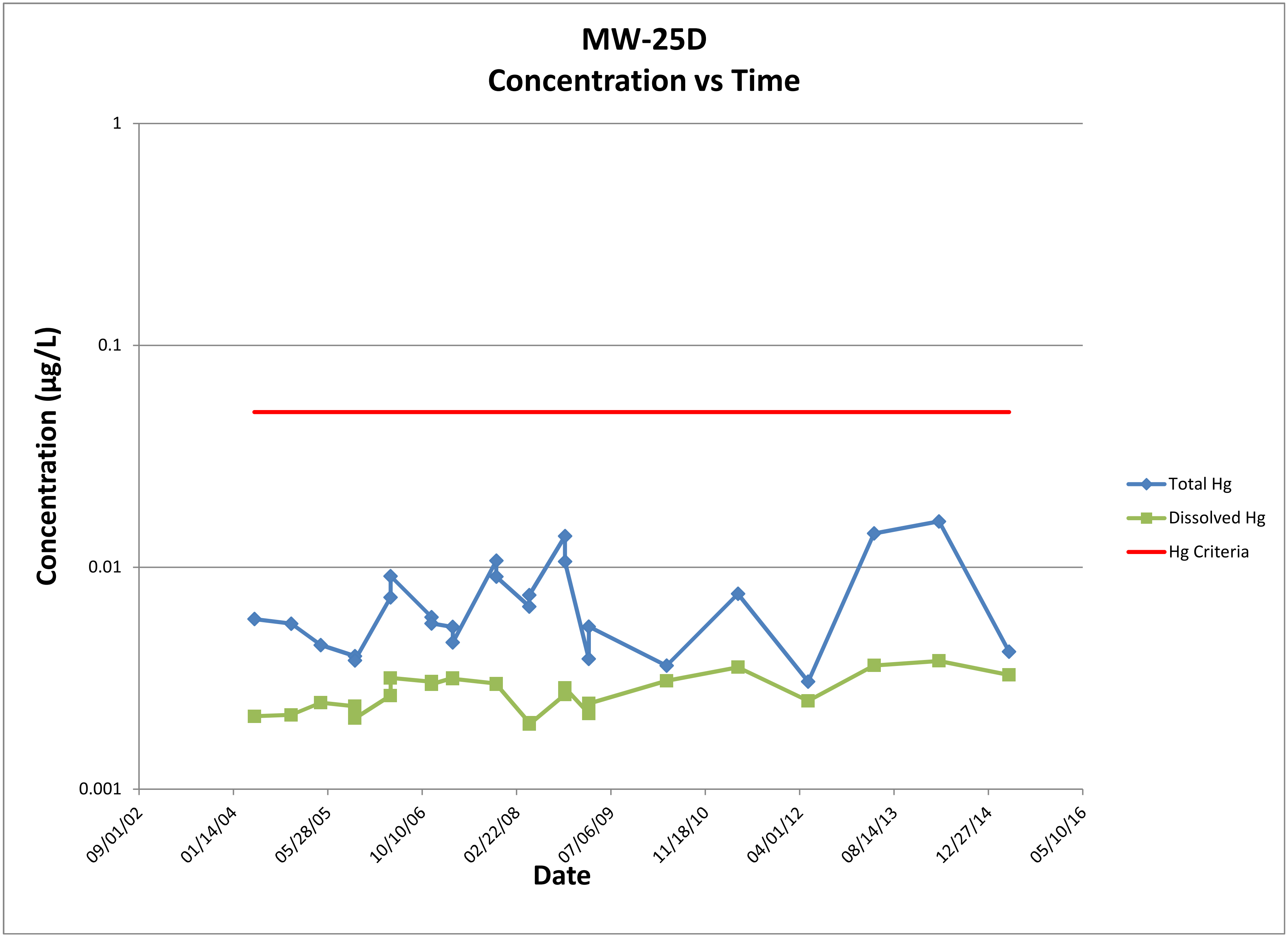
MW-22
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
0.0001
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
Date
Total Hg
Dissolved Hg
Hg Criteria


MW-22D
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
0.0001
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
Date
Total Hg
Dissolved Hg
Hg Criteria

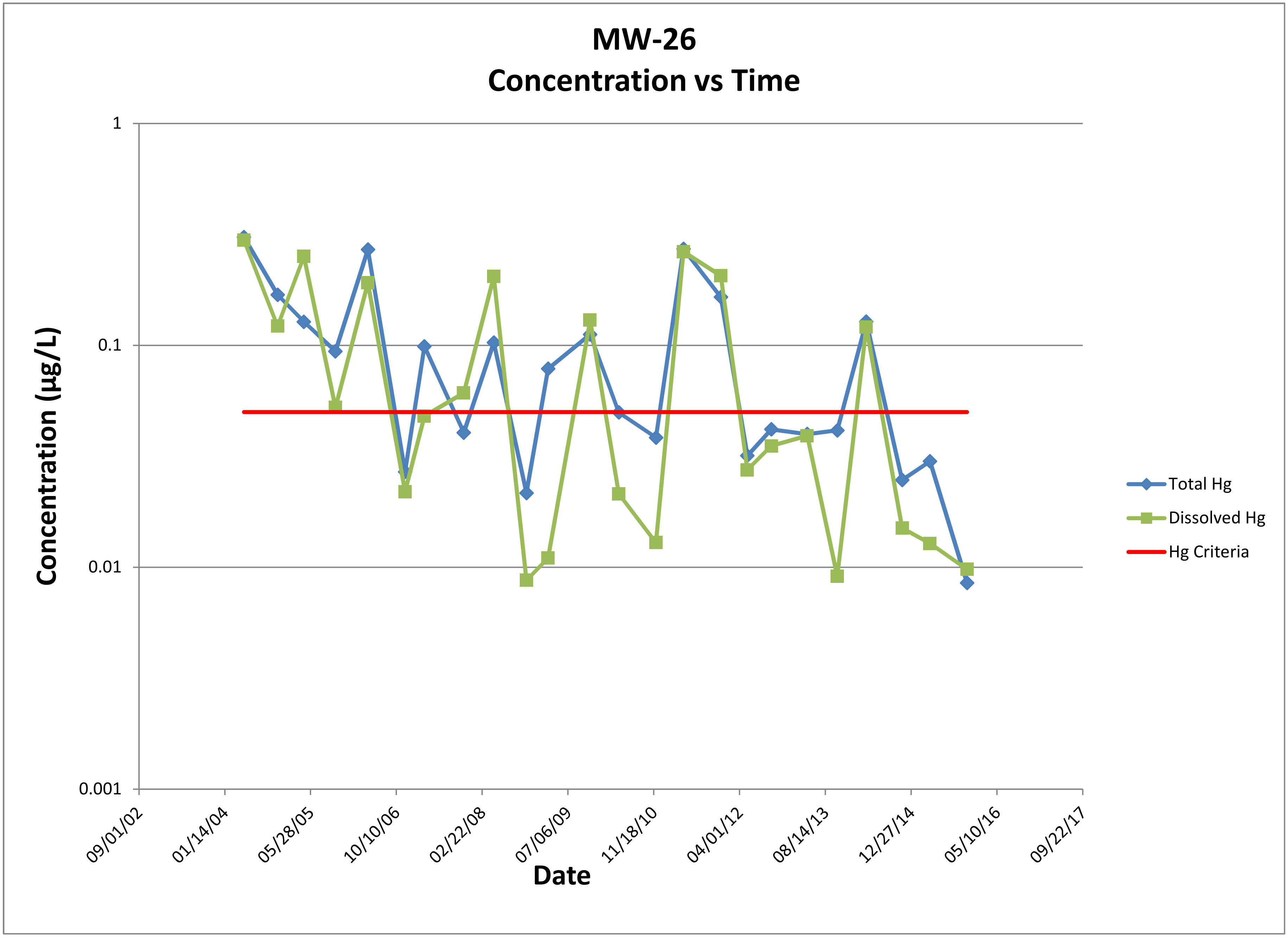

MW-23D
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
0.0001
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria

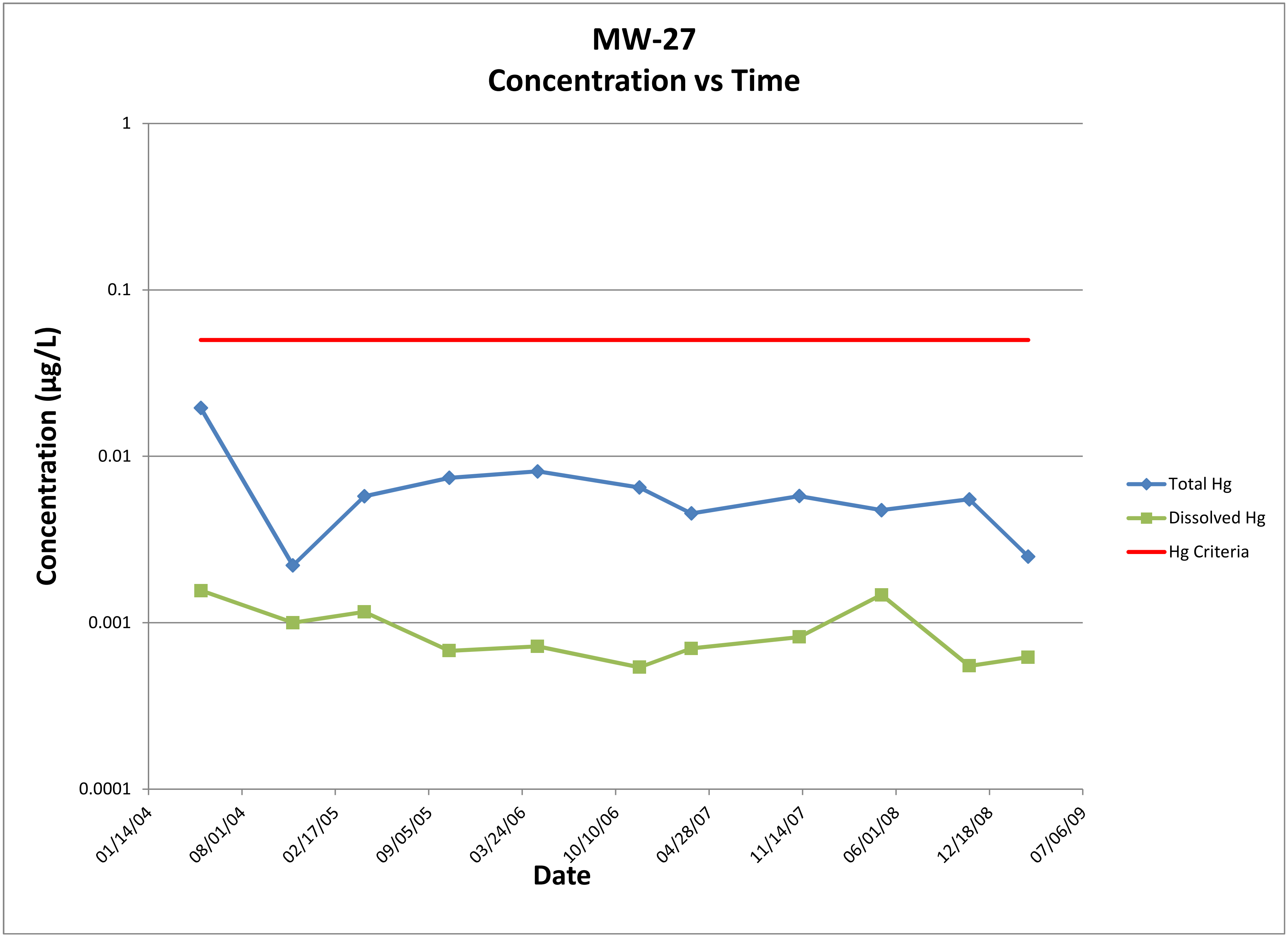

MW-24
Concentration vs Time
10
1
0.1
0.01
0.001
Concentration (µg/L)
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
Date
Total Hg
Dissolved Hg
Hg Criteria

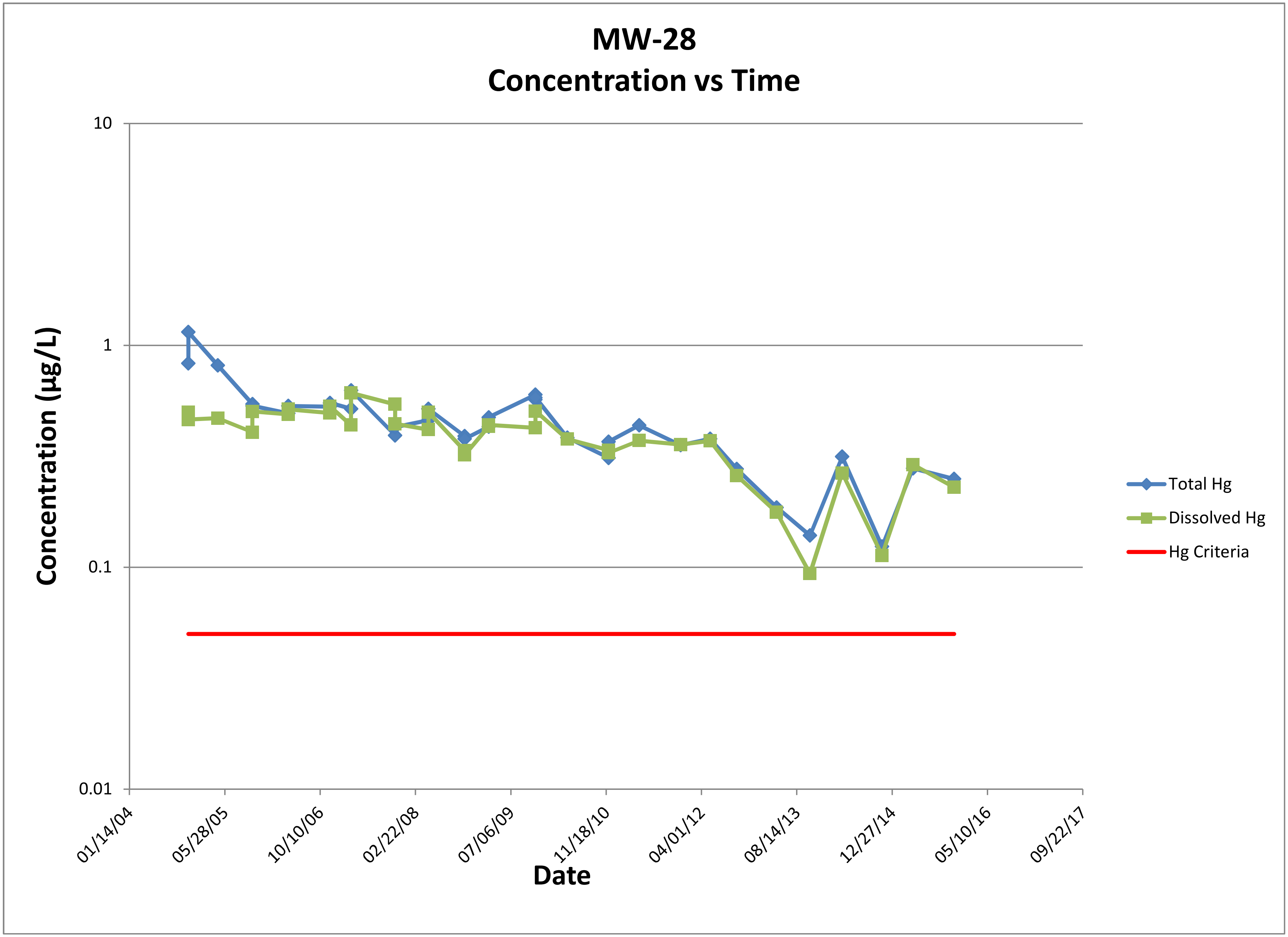

MW-24D
Concentration vs Time
1
0.1
0.01
0.001
0.0001
Concentration (µg/L)
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
Date
Total Hg
Dissolved Hg
Hg Criteria

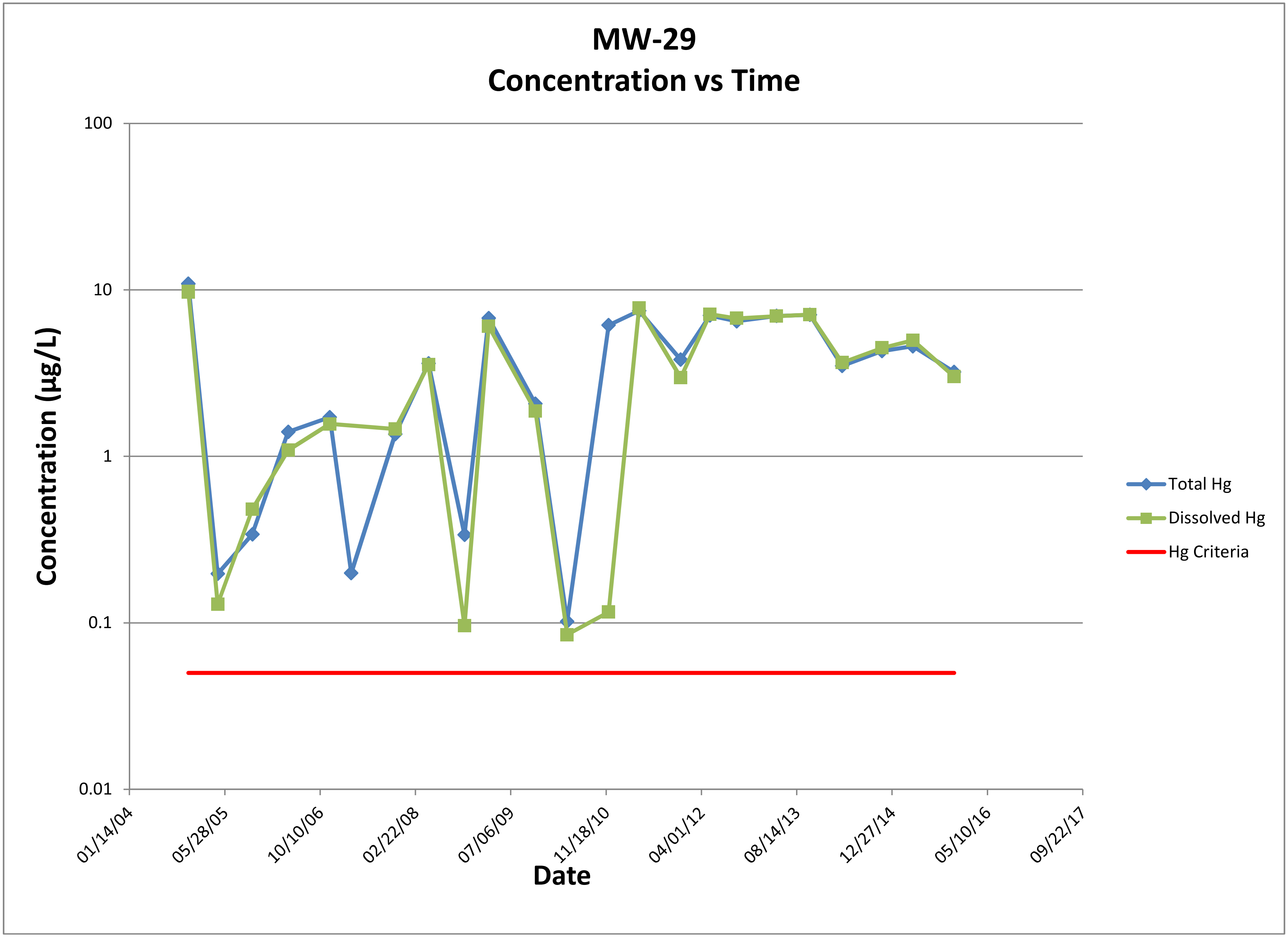


MW-25D
Concentration vs Time
1
0.1
0.01
0.001
Concentration (µg/L)
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
Date
Total Hg
Dissolved Hg
Hg Criteria

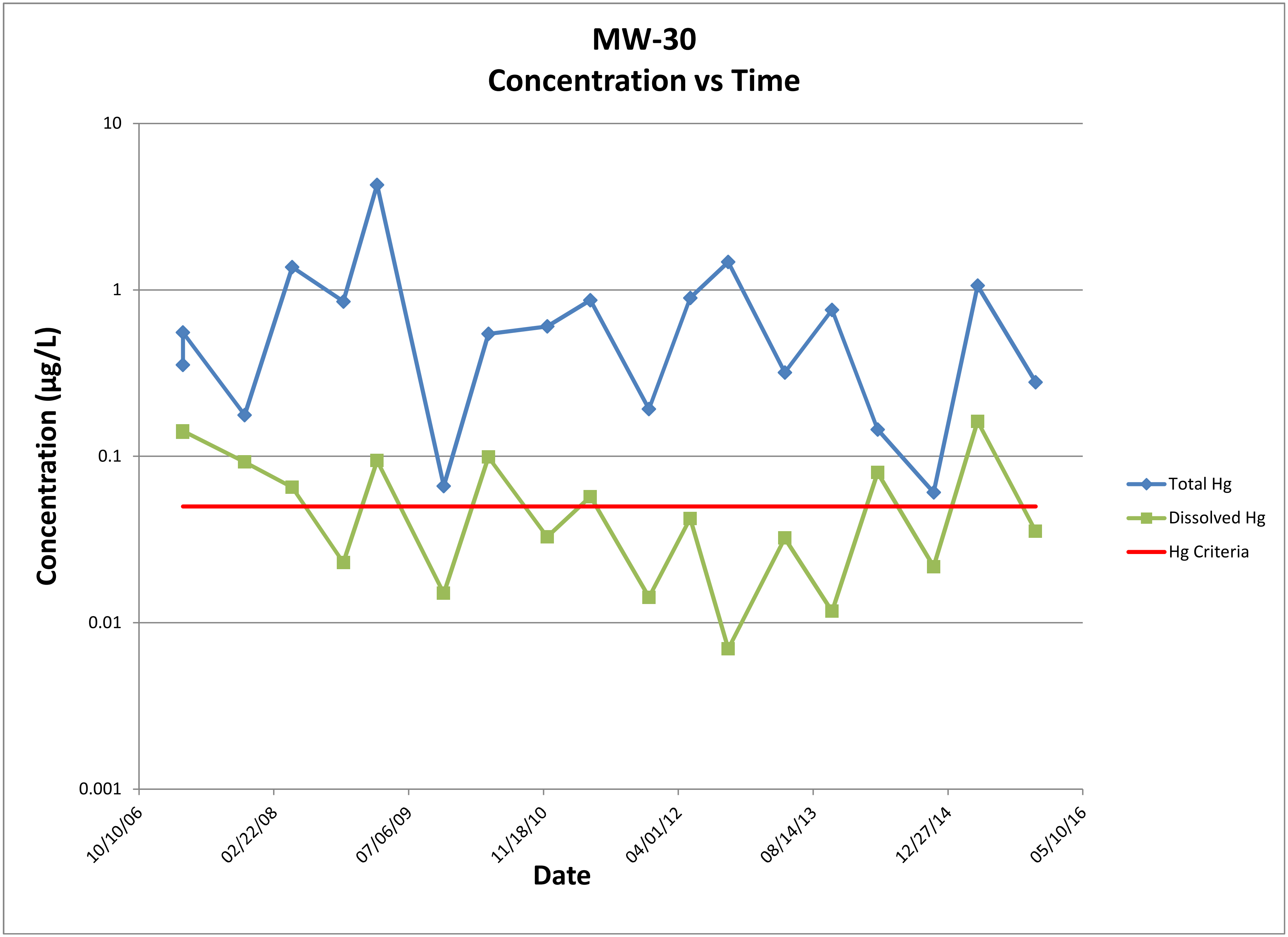

MW-26
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
09/01/02
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria


MW-27
Concentration vs Time
1
0.1
0.01
0.001
0.0001
Concentration (µg/L)
01/14/04
08/01/04
02/17/05
09/05/05
03/24/06
10/10/06
04/28/07
11/14/07
06/01/08
12/18/08
07/06/09
Date
Total Hg
Dissolved Hg
Hg Criteria

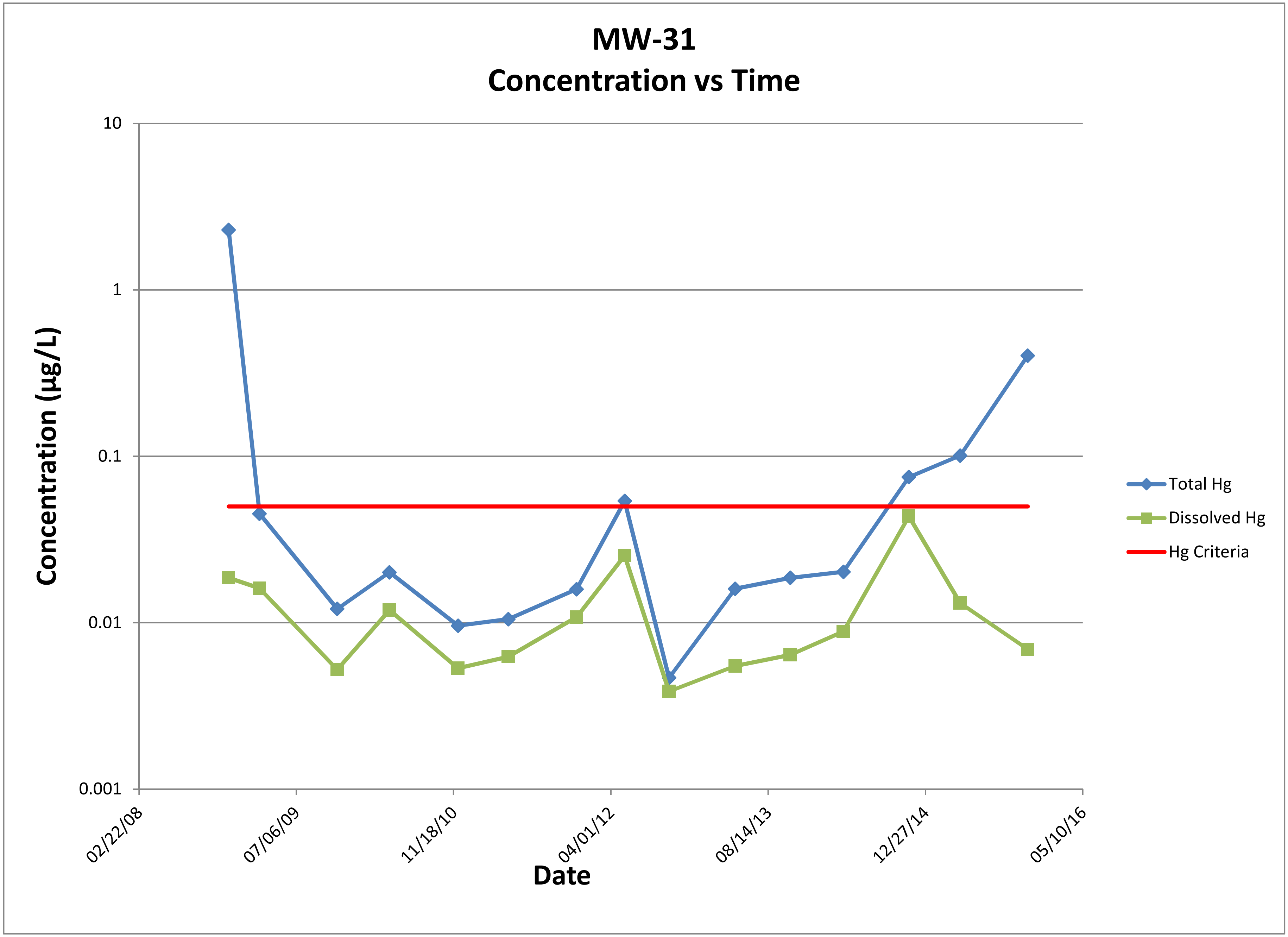

MW-28
Concentration vs Time
10
1
0.1
0.01
Concentration (µg/L)
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria



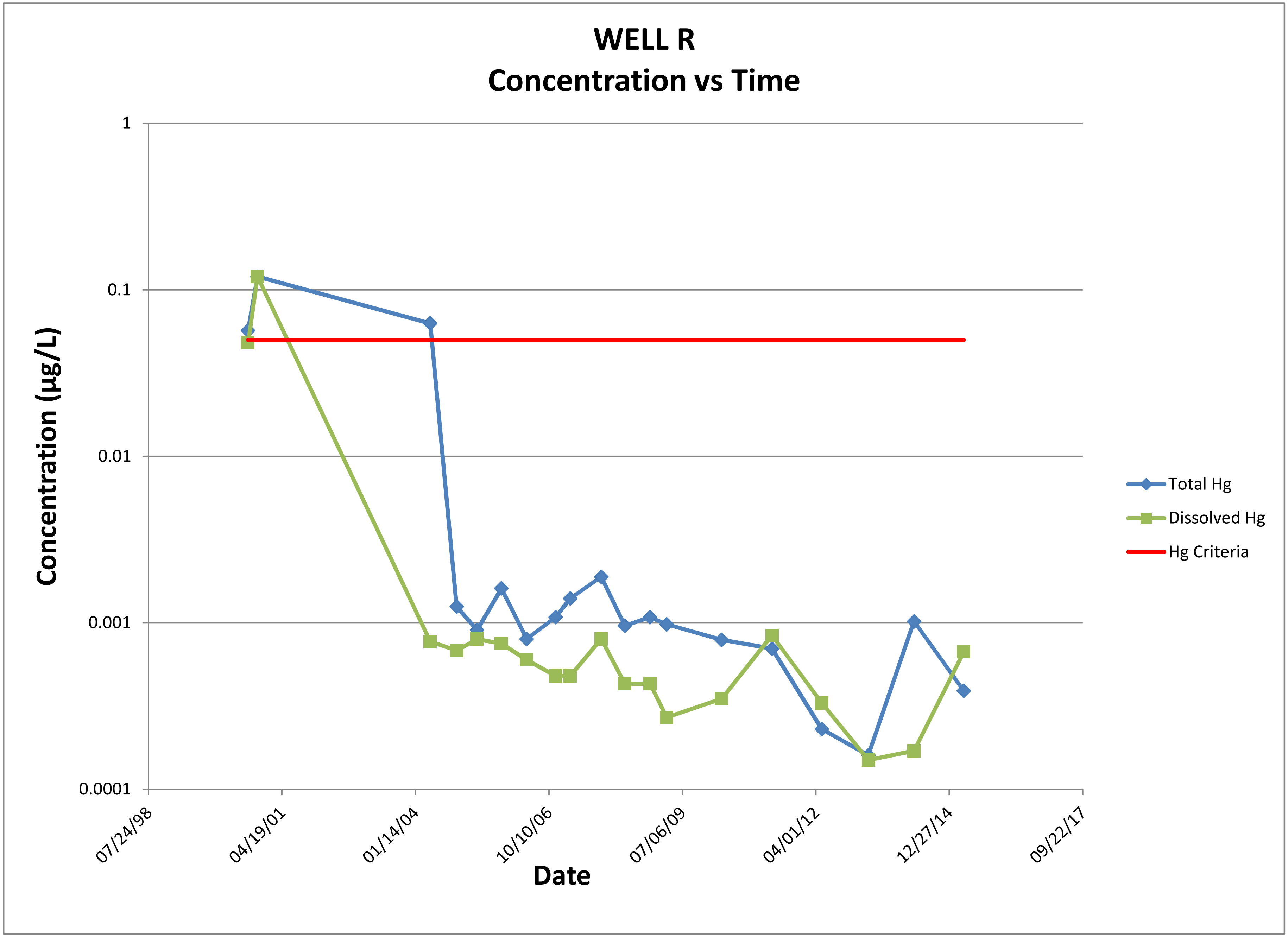
MW-29
Concentration vs Time
100
10
1
0.1
0.01
Concentration (µg/L)
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria

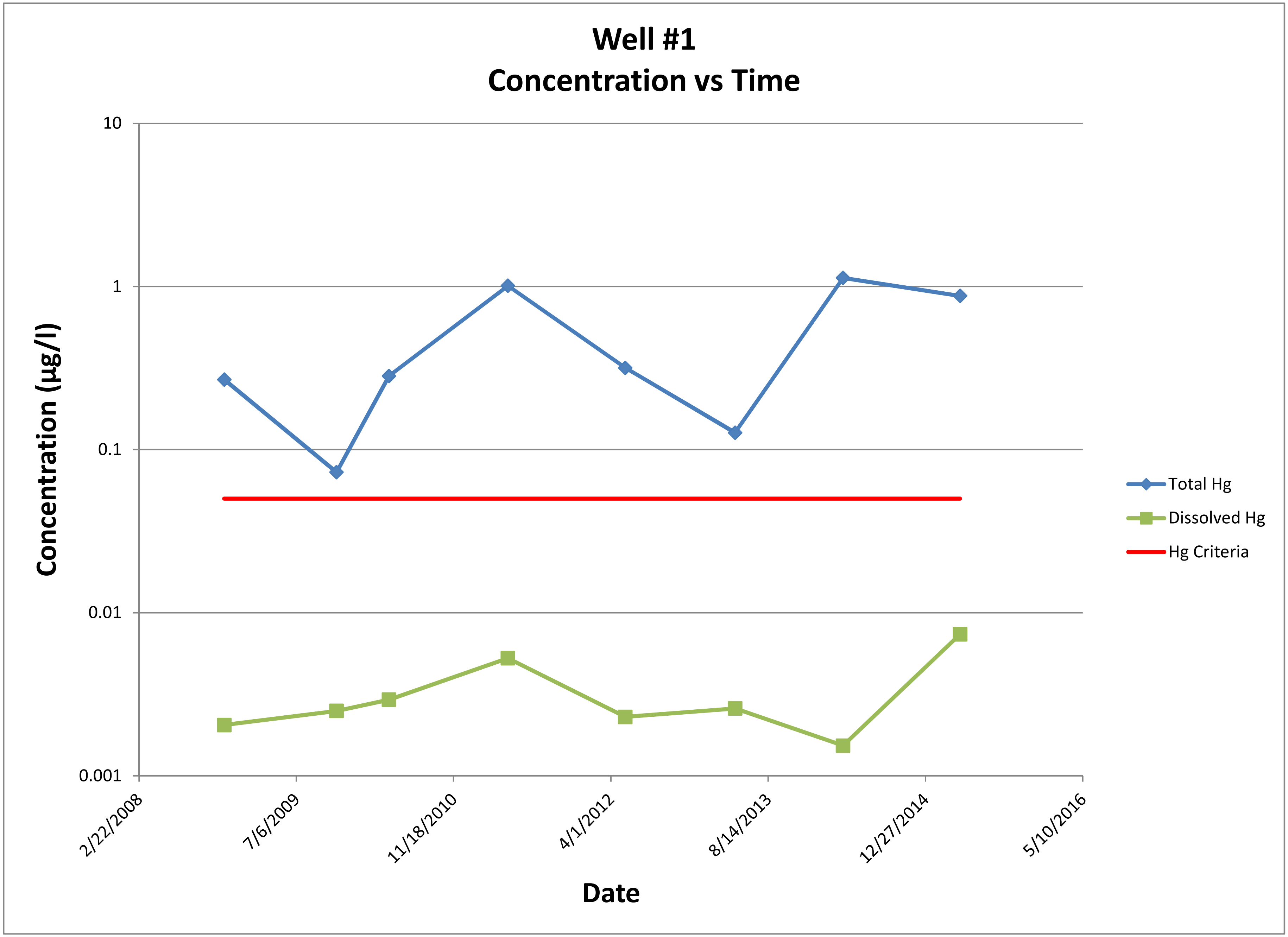


MW-30
Concentration vs Time
10
1
0.1
0.01
0.001
Concentration (µg/L)
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
Date
Total Hg
Dissolved Hg
Hg Criteria

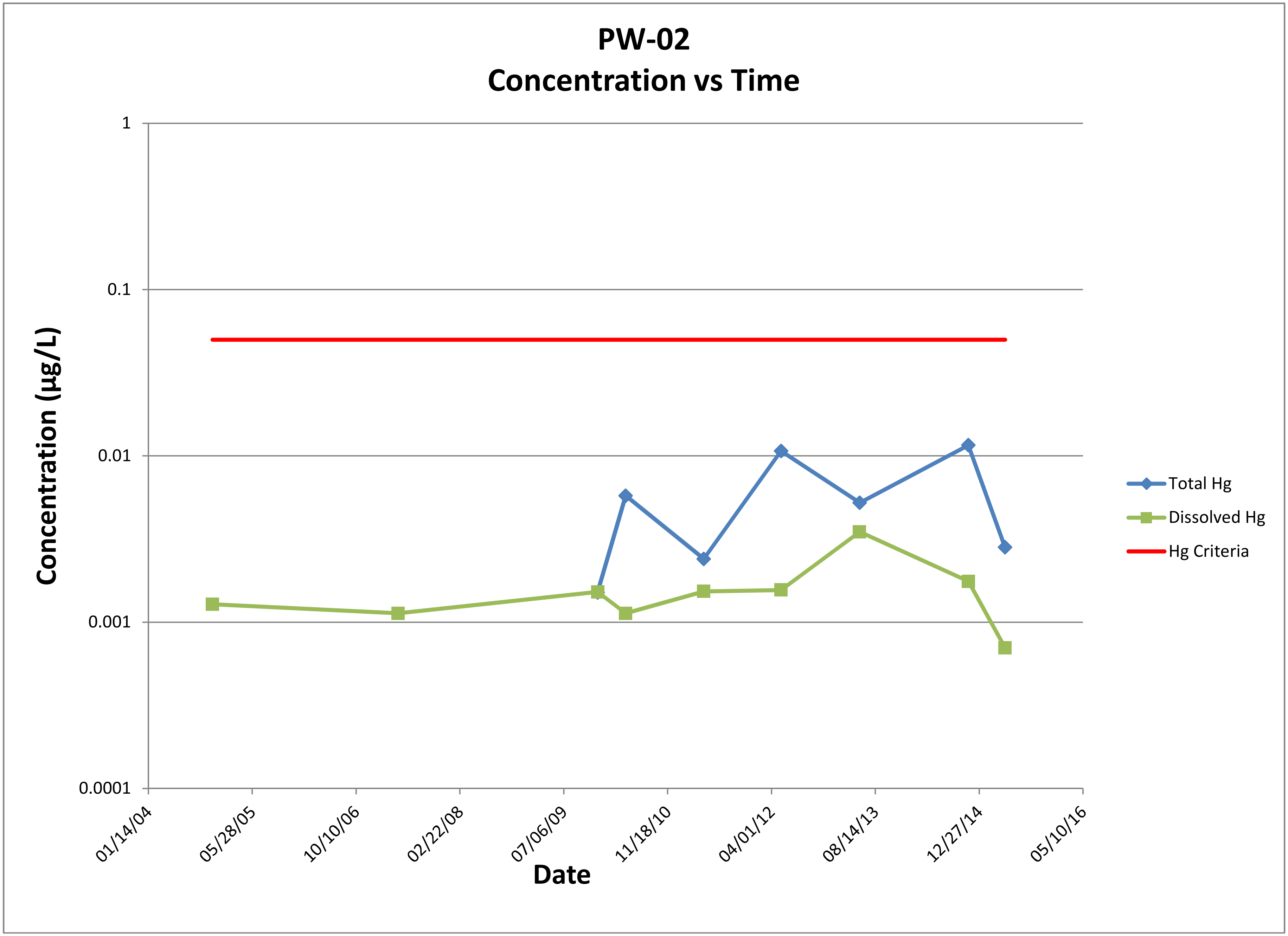


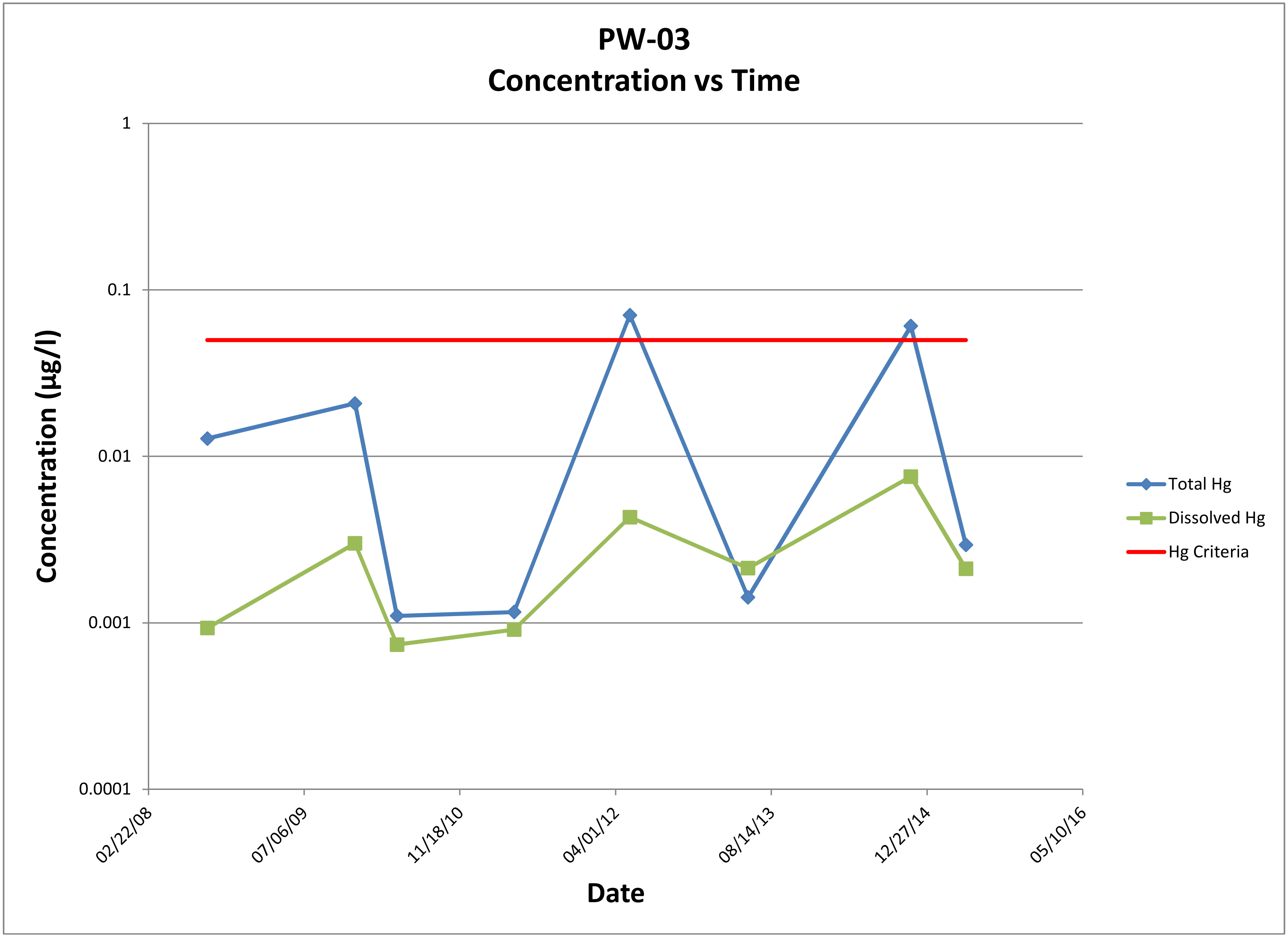
MW-31
Concentration vs Time
10
1
0.1
0.01
0.001
Concentration (µg/L)
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
Date
Total Hg
Dissolved Hg
Hg Criteria


WELL R
Concentration vs Time
1
0.1
0.01
0.001
0.0001
Concentration (µg/L)
07/24/98
04/19/01
01/14/04
10/10/06
07/06/09
04/01/12
12/27/14
09/22/17
Date
Total Hg
Dissolved Hg
Hg Criteria

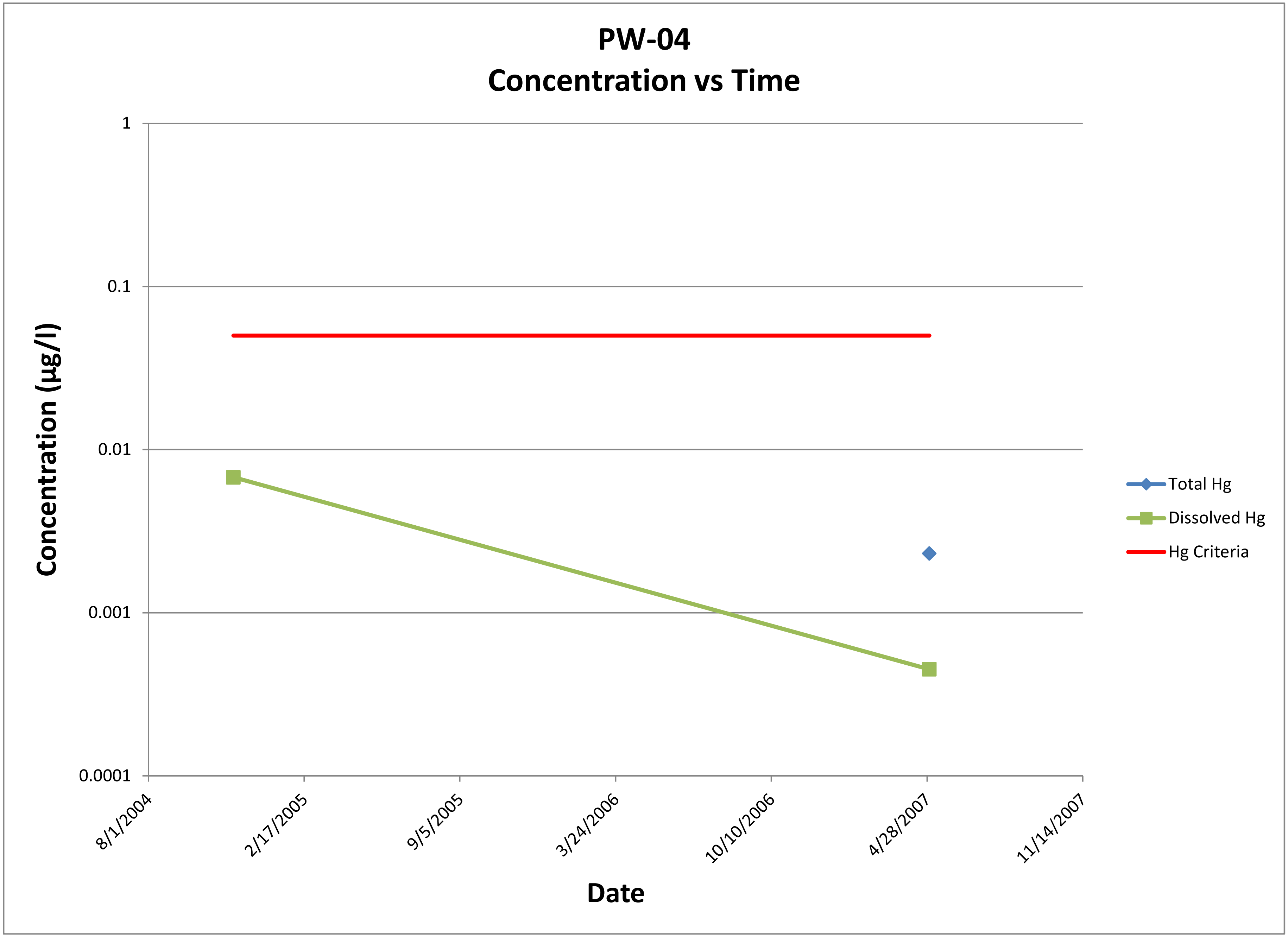


Well #1
Concentration vs Time
10
1
0.1
0.01
0.001
Concentration (µg/l)
2/22/2008
7/6/2009
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
Date
Total Hg
Dissolved Hg
Hg Criteria

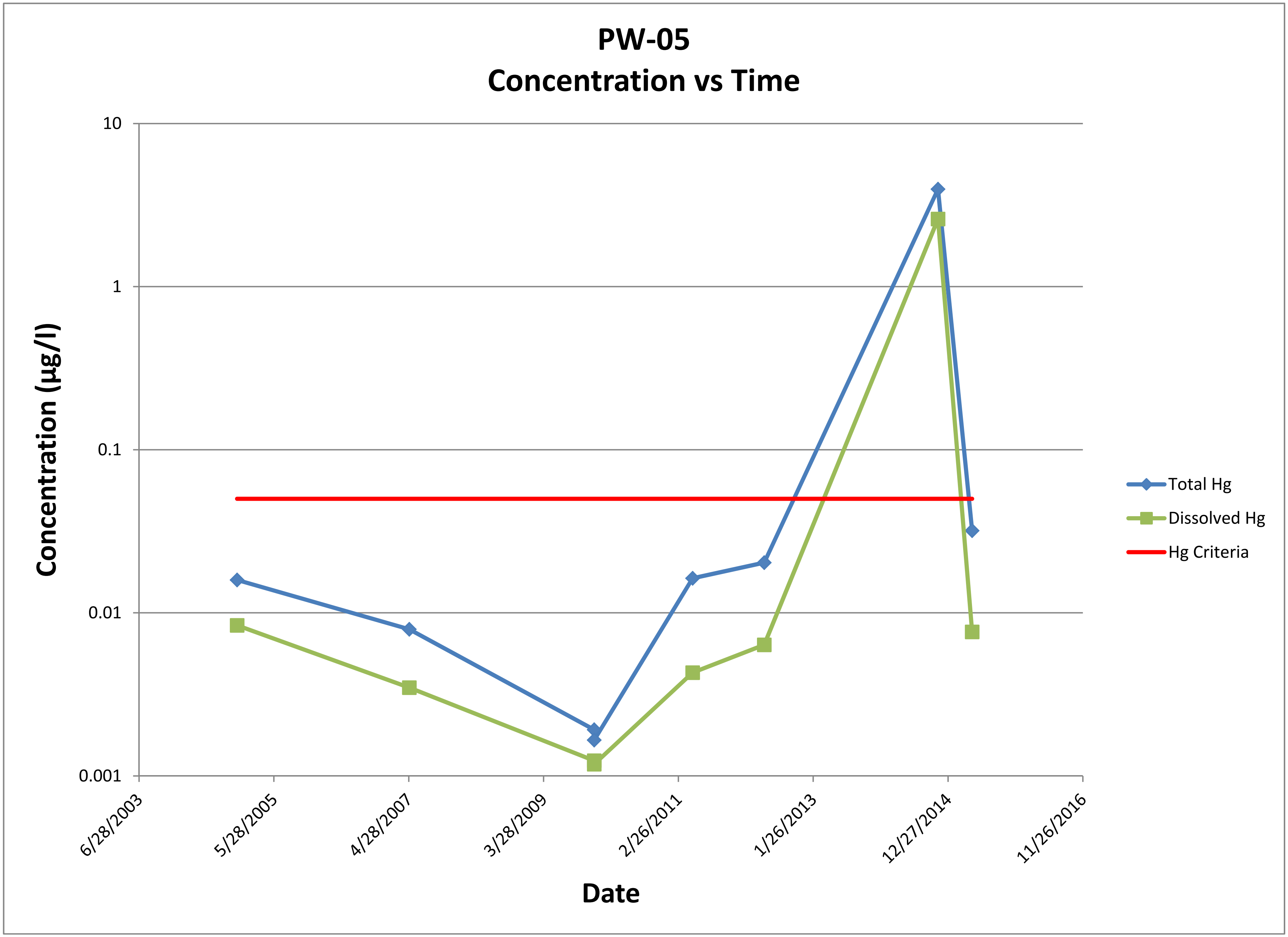

PW-02
Concentration vs Time
Concentration (µg/L)
1
0.1
0.01
0.001
0.0001
01/14/04
05/28/05
10/10/06
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
Date
Total Hg
Dissolved Hg
Hg Criteria



PW-03
Concentration vs Time
1
0.1
0.01
0.001
0.0001
Concentration (µg/l)
02/22/08
07/06/09
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
Date
Total Hg
Dissolved Hg
Hg Criteria



PW-04
Concentration vs Time
Concentration (µg/l)
1
0.1
0.01
0.001
0.0001
8/1/2004
2/17/2005
9/5/2005
3/24/2006
10/10/2006
4/28/2007
11/14/2007
Date
Total Hg
Dissolved Hg
Hg Criteria



PW-05
Concentration vs Time
10
1
0.1
0.01
0.001
Concentration (µg/l)
6/28/2003
5/28/2005
4/28/2007
3/28/2009
2/26/2011
1/26/2013
12/27/2014
11/26/2016
Date
Total Hg
Dissolved Hg
Hg Criteria

Appendix B

Groundwater Sampling Protocol

Groundwater Sampling Protocol for Low-Level Mercury
Former DuPont Waynesboro Plant
Waynesboro, Virginia

Introduction

The following describes the field procedures for sampling groundwater for low-level mercury analysis (EPA Method 1631) at the Invista (formerly DuPont) Waynesboro, VA facility. The procedures listed herein are results oriented and based upon the EPA Method 1669. Review and familiarization of EPA Method 1669 text describing techniques and procedures for sampling of low-level metals is required before fieldwork begins. A short video is also available for review.

Well Setup

One member of the team is designated “Clean Hands” and the other “Dirty Hands.” This designation should remain in effect through the duration of the field event for consistency and to prevent confusion of duties by each team member. Well sampling must be conducted from wells considered ‘clean’ to those considered ‘dirty’ to help prevent cross-contamination. The individual designated as "Clean Hands" is responsible for all operations involving contact with the sample container and transfer of the sample from the collection device to the sample container. “Dirty Hands” is responsible for preparation of the samplers (except the sample container itself), operation of any equipment, and for all other activities that do not involve direct contact with the sample or equipment that may have direct contact with the sample.

During equipment, container, and sample handling both team members remain down-wind of the well and sampling equipment. Sample containers and equipment must not be exposed to team members’ exhaled breath. Care must be taken to prevent disturbance of surroundings during setup and sampling at each location. Identification of potential influences to samples from the surroundings will be recorded (vehicle exhaust, plant processes, wind direction changes, etc.).

Sampling personnel will wear clean non-talc gloves. Gloves will arrive at the site in new unopened condition. Viton or neoprene inner gloves must be worn due to the potential for constituents in ground water in addition to mercury. Outer gloves will consist of Latex for “Dirty Hands” and polyethylene for “Clean Hands.”

1. Upon arrival at the sampling location, both team members prepare the sampling area by removing debris, excess vegetation, and any unnecessary objects.
2. Both team members thoroughly rinse hands with tap water and dry with a clean paper towel. “Dirty Hands” opens each box of gloves and removes the top pair. “Clean Hands” removes and dons a pair of gloves one glove at a time taking care that the only contact with the outside of the glove is at its cuff.
3. Both team members setup the sampling table and cover it with clean plastic sheeting secured at the edges with duct tape.
4. “Dirty Hands” opens a box of poly-coated Tyvek and removes the top suit. “Clean Hands” removes and dons the next suit taking care to minimize all contact with the outside of the suit. From this point forward, the team must be vigilant to prevent unnecessary contact of personal protective equipment (PPE) with any other object or material.
5. “Clean Hands” removes and replaces outer gloves as described in step 2.
6. “Dirty Hands” opens the well head, collects and records PID, MVA, and water level data, and sets-up sampling equipment.
7. “Dirty Hands” records the tubing “Roll ID” number assigned during QA/QC blank collection.

8. “Dirty Hands” replaces outer Latex gloves. “Dirty Hands” opens the outer bag containing the tubing.
9. “Clean Hands” opens the inner bag and removes the tubing.
10. “Clean Hands” installs the tubing (do not make contact with pump) while “Dirty Hands” holds the pump. Submersible pumps should be held while still in their protective covering.
11. “Dirty Hands” makes any necessary cuts to the tubing using pre-cleaned cutters (no direct hand contact is made with the tubing).
12. “Clean Hands” lowers the tubing (pump and tubing if submersible) into the well taking care not to touch the inlet of the tubing and minimizing tubing contact with the well casing.
13. “Dirty Hands” turns on the pump, maintains equipment during purging, and keeps the field log and parameters book.

Care must be taken to maintain the covered ‘pristine’ nature of new and pre-cleaned sampling equipment. No direct contact of any equipment or portions thereof that may come into contact with the sample may be impacted by “Dirty Hands” (pumps, tubing, filters, water level probe, etc.). Changing of gloves cannot be too frequent, though care must be taken at all times.

Sample Collection

Sample bottles remain in the cooler and in their protective bags until the moment of sample collection.

1. “Clean Hands” replaces outer gloves as described in step 2. “Clean Hands” dons lab provided pre-cleaned gloves.
2. “Dirty Hands” opens the cooler, retrieves the bottles, and opens the outer bag containing the sample bottles.
3. “Clean Hands” opens the inner bag, opens the bubble wrap, and removes the sample bottle(s).
4. “Clean Hands” rinses the bottle and cap three (3) times in the well purge stream, then collects the sample for Total Hg analysis and reseals the bottle.
5. “Clean Hands” places the sample bottle in the bubble wrap, back into the inner bag, and closes the inner bag.
6. “Dirty Hands” places the sample label on the outer bag and places the sample in the cooler.
7. Both team members replace their outer gloves as described in the step 2 of the Well Setup Section.
8. “Dirty Hands” retrieves the 0.45um filter and opens the outer bag. “Clean Hands” removes and opens the inner bag.
9. “Clean Hands” holds the filter within its protective wrapper and connects the still flowing purge tubing to the filter inlet. “Clean Hands” uses the tubing to pull the filter from the protective wrapper. The filter is purged of three (3) volumes before sampling.
10. Sampling is completed by repeating Steps 1–5.

Sample bottles and filters never make contact with any object or material except the inner storage bag and “Clean Hands” outer gloves. Sample filters are to be used only once and discarded.

QA/QC Samples

Detailed procedures for handling, preparation, and collection of QA/QC samples will be followed in the same manner as all other samples. QA/QC samples will be collected as described below.

1. Blank samples will be collected from each roll of tubing used for low-level mercury sampling. Two feet of tubing will be removed from each end of the roll prior to sampling. Laboratory de-ionized (DI) water will be poured through each roll of tubing and collected for laboratory analysis. Each roll of tubing will be labeled with its corresponding sample ID.
2. Equipment blanks will be collected at the beginning of each sampling day. Blank collection will consist of pouring laboratory provided de-ionized water over and through a submersible pump and collecting in sample bottles.

Decon Procedures

All sampling equipment and appurtenances will be discarded or decontaminated between wells. All tubing, filters, plastic sheeting, PPE, etc. will be bagged and disposed of in onsite dumpsters. A ‘new’ submersible pump will be used at each well throughout the day. Submersible pumps will be deconned and wrapped in protective bags at the end of each sampling day for use on the following day.

Decon of submersible pumps will require the use of two cleaned and rinsed 5-gal buckets. Each bucket will be numbered with a permanent marker and filled with potable water.

1. Spray each pump with dilute HCl solution making sure solution gets throughout the pump including through the propeller.
2. Place several pumps at once into bucket #1 and circulate for at least five minutes at the maximum pumping rate.
3. Change outer gloves.
4. Remove pumps and allow excess water to drain back into the bucket.
5. Place pumps into bucket #2 and circulate for at least five minutes at the maximum pumping rate.
6. Change outer gloves.
7. Remove one pump at a time and allow excess water to drain back into the bucket.
8. Rinse with reagent-grade DI water.
9. Double bag each pump in new zipper lock bags.
10. Place all bagged pumps into a new polyethylene bag.
11. Dispose of decon water, rinse buckets for re-use, and place buckets in large polyethylene bags.